Humphrey Devereux his Book
pretium 2/
1750

A NEW THEORY OF ACUTE and SLOW Continu'd FEVERS:

ORIGINAL TREADWELL COLLECTION

WHEREIN,
Beſides the Appearances of ſuch, and the Manner of their Cure, occaſionally, the Structure of the *Glands*, and the Manner and Laws of *Secretion*, the Operation of *Purgative*, *Vomitive*, and *Mercurial Medicines*, are Mechanically Explained. By George Cheyne M. D.

To which is prefixed,

An ESSAY CONCERNING THE IMPROVEMENTS of the THEORY of MEDICINE.

The Sixth Edition, Corrected.

> ——— *ſi propius ſtes,*
> *Te capiet magis.*——— Horat. De Arte Poët.

LONDON:
Printed for GEORGE STRAHAN, at the
Golden Ball, in *Cornhill*. MDCCXLIV.

THE PREFACE.

T*O write any thing tolerable about* Fevers, *or any thing worſe than what has already been advanced by ſome one or other on the Head, is perhaps no eaſy Matter. The ridiculous Manner of accounting for their Cauſes and Symptoms, uſed by ſome Pretender's to* Medicine *and* Philoſophy, *has perhaps contributed (in its way) to that Contempt, to which (with ſuch Expence of* Satire *and* Wit) *they and their Art have been expos'd.*

I have not the Arrogance to think the few following Sheets will conduce any thing to wipe it off; but of this I am ſure, if this Theory *prove falſe, the Choices behind are fewer by one of the true Kind, which endeavours to account from their Appearances from* Mechanick *Principles.*

The wiſer Part of Mankind are now perſuaded, That this Machine we carry about, is nothing but an Infinity of branching and winding Canals, filled with Liquors of different Natures; and I am mightily out in my Conjectures, if for the future any be heard about

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Theories *of* Diſeaſes, *or the Manner of the Operation of Medicines, who do not reaſon from theſe* Data, *and their neceſſary Conſequences. And ſeeing* Continual Fevers *are only a Complication of Symptoms, which naturally follow upon a general Obſtruction of theſe Canals (or the* Glands *which they conſtitute) and the neceſſary Effects thereof, as I reckon; None I hope will be angry, I have called ſuch a Manner of accounting for them,* New, *ſeeing for any thing I know (as to the main thereof) it is really ſo.*

For the Structure of the Glands, *and the Buſineſs of* Secretion, *the Foundation is* Bellini's, *but I hope it has loſt nothing in my Hands. I have added ſome Things, extended others, and made all plain and conſequential.*

As to the other Things here occaſionally explained, which, adding what Bellini *has advanced about* Blood-Letting, *make up the great and principal Operations performed by Medicines on animal Bodies; I have very frankly borrowed what of them I found for my Purpoſe, from* Borelli, *the aforeſaid* Bellini, *and another* Gentleman, *whom I reckon the Ornament of his Profeſſion and our Country: But for the moſt Part, pointing at Place and Perſon. And I ſhall reckon my ſelf no more a* Plagiary *for this, than a Lawyer is to be accounted one for quoting his* Code, *or* Pandects.

The Occaſion of entring upon theſe Thoughts, was the Noiſe and Buſtle that was made among us about Vomiting *in* Fevers, *about a Year ago: I endeavoured to ſatisfy my ſelf ſo as you may ſee, and had the Vanity to think there might be ſome as great Fools as I; if I be miſtaken it is not the firſt time.*

I have not been over nice in ranging the Particulars here contained; thoſe who read the whole will ſee their Dependance, and for others I was not at the Pains to lay in.

The Language is that which moſt eaſily dropt from my Pen at firſt writing, the Roughneſs of ſome Terms of Art I could not avoid, and the Purity of the Engliſh *Tongue is neither the growth of our Country, nor of my Occaſions; if it be intelligible it is all (and perhaps ſome may ſay more than) I deſigned.*

I neither expect nor deſire any Reputation from theſe Papers, for I ſufficiently know how few ſuch things oblige. Beſides I am dreadfully afraid few will read them, and not over many underſtand them, for want of the neceſſary Qualifications of a moderate Attention, and a ſmattering of the Mathematics. The firſt is abſolutely neceſſary, but for the latter, they may even have a ſtrong Faith, though, both for them and my ſelf, I could wiſh it were joined with Knowledge.

As for Cenſure, I am in no great dread of it; for I ſhall lie ſecure (becauſe concealed) and ſee its Adverſaries (if it have the Honour to provoke any) ſhoot at Rovers. If any ſhall take the Pains to confute what I have advanced he may do it very ſafely for his humble Servant; if he bungle it, he will do me an honour, by ſhewing it is not ſuch as every Body is able to diſprove; if he do it to Purpoſe, he will do me a Kindneſs, by freeing me from Errors. I deſign for the future to meddle no more with it, than if it had dropt from the Clouds.

In fine, all my preſent Concern is for the Bookſeller; if he be not a Loſer, (which Miſfortune would be the moſt effectual Confutation) it is indifferent to me, whether it periſh by a particular, or the general Conflagration.

AN ESSAY CONCERNING THE IMPROVEMENTS OF THE *Theory of Medicine.*

THERE are none of the Liberal Arts more neceſſary or uſeful to Mankind than *Medicine*; and yet, by what ill Fate I cannot tell, there is not one of them which is not brought nearer Perfection than it: The Inſtitutions of moſt of the reſt are reckoned neceſſary Qualifications for a *Gentleman*; but few ſtudy *Medicine*, ſave thoſe who deſign to live by the Practice thereof. How to account for this, is no eaſy Matter, unleſs we ſay (what is true) that for the moſt part it has been hitherto ſo ſcurvily treated, the Grounds of its Theory, and conſequently

ſequently of the Practice built thereon, made ſo precarious, abſurd, and often contradictory, that Men (no otherwiſe obliged thereto) were loth to lay out their Time and Pains on ſuch Uncertainties. They ſaw many Practitioners, rather *Empirics* than *Phyſicians*, who preſcribed ſuch Remedies, as they read or heard had been ſucceſsful in Caſes, which they imagined like that of their Patients; but knew nothing either of the Cauſe of the Diſtemper, or of the Reaſon of the Cure.

IT is true indeed, it is ſo very hard to obtain any tolerable Knowledge of the Hiſtory of Nature, and of the Springs of Life, of the Virtues of Medicines, and the Texture of the animal Body; the Manner of the Operation of the former, and the Laws of the Motions of the latter, that this may be one very good Reaſon, why Medicine has not been farther advanced. Yet notwithſtanding all theſe, had the genuine and true Method of obtaining theſe Things been conſtantly and vigorouſly purſued but half the Time of what has paſſed, ſince *Medicine* firſt came to be cultivated; it had made another Appearance than it does at this Day. If four thouſand Years ago, when Men ſaw the glorious Body of the Sun riſe ſometimes in one Place, and ſometimes in another, and ſet with the like Variety: At one Seaſon juſt peep up, and then down again; at another ſtay a long Time with us; in one Place never diſappear, at another never be ſeen for a conſiderable Period; and at a third, ſtay and go at equal Diſtances of Time: When they ſaw the Brightneſs of a Summer's Noon-tide, all of a ſudden, turned into the palpable Darkneſs of a Winter's Midnight, without knowing any Reaſon for the ſame: When they ſaw the Moon appear ſometimes in one Figure, ſometimes in another; riſe here to Day, there a few Days after; and a ſhort Time after this, no where at all; at one Seaſon all clear, the next Minute all over dark; now ſtand, then go, now before the Sun, then behind him; now near him, then far from him, with a thouſand other Varieties: When they ſaw all the Changes, Viciſſitudes, and various Poſitions of the Planets, the Uncertainties of the Tides, and the numberleſs Number and Order of the fixed Stars: I ſay, then, when they only ſaw, and knew nothing more about theſe, if any had ſaid, that all theſe infinite Varieties might be reduced to Rule and Order, that we might come to underſtand the Laws of their Motions, and the Nature of their Orbits, their Poſitions, Appearances, and Diſtances from us, and one another; that we might come to predict their Settings and Riſings, their Stations and Retrogradations, their full and partial Appearances, and their compleat and incompleat Diſappearances, and that too almoſt to the greateſt Preciſion we are capable to diſtinguiſh or apprehend. But (which is the utmoſt Perfection of theſe things) if any had ſaid, we ſhould at laſt come to underſtand the Reaſon and Cauſe of theſe various Motions and Appearances, he would have ſcarcely been believed. And yet we know all theſe things have come to paſs in our Days; and that, only by purſuing a true Method, every one improving upon the Obſervation of his Predeceſſor, 'till all the *Phænomena* were compleatly gathered, and then applying the Science of Quantity, (*i. e.* Geometry and Numbers) to inveſtigate their Orbits, their Diſtances, the Laws of their Motions, their Natures, and their Cauſes; by ſuch Means as theſe, Men have brought *Aſtronomy* almoſt to the higheſt Pinacle of Perfection. Now, if *Medicine* had been thus treated (as it ought to have been) but half the Time which has paſſed, ſince it came firſt to be cultivated; I can boldly affirm, if it had not been brought to Certainty and Demonſtration; yet, it had been above the Contempt and Reproaches which are now daily thrown upon it; and had not been the common Theme of the loweſt Pretenders to Satire and Wit.

WHATEVER be the Principle of Perception in human, or of Senſation in brute Animals; yet it is allowed by all Sects of *Philoſophers* and *Phyſicians*, that all the Diſtempers and Diſorders of the Body of both are owing to a Vitiation of the Quantity, Quality, or Motion of the Fluids, or to a bad Diſpoſition and Texture, a Diſtortion, Diſtention, Luxation, or Dilaceration of their Conduits, and the other ſolid Parts of their Bodies; and that Medicines operate by the Application and Mixture of their Juices, or by a Communication of their Virtues to theſe. And ſeeing all theſe are the Modifications and Qualities of material Beings, which have the Dimenſions of Bodies, and are therefore *Quanta*; it neceſſarily follows, that the only Method of examining the Effects and Cauſes of theſe Qualities, is by applying to them the Doctrine of Quantity, *i. e.* Geometry and Numbers; and it is altogether unaccountable, how the World has not been ſufficiently aware of this, 'till within theſe few Years.

THE Antients indeed have given us many noble Remedies for ſeveral Diſtempers; many ſound Advices about the Management of a Patient, and for the Diſcovery of the Names (not the Natures) of moſt Diſeaſes, by telling us what Antecedents, Conſequents, and Concomitants were affixed to ſuch a Diſtemper, which they called by ſuch a Name. In a word, they have done tolerably as to the practical Part, though, after all, many of their Receipts and Remedies ſeem very little to us now: For ſuch is the Intemperance, Indiſcretion, and Lewdneſs (to which, either perſonal or tranſmitted, I would aſcribe many of our Maladies) of our Days, that we are in compleat Poſſeſſion of all their Diſeaſes, heightened by as many Degrees of Malignity, as there are Years betwixt us and them; and in the mean Time we have begotten an infinite Variety of plaguy new ones, againſt which, moſt of their Remedies would have leſs Force, than the Children of our Age againſt the Gians of theirs. However, Practice was the only Part of Medicine they can be ſaid to have any whit improved. For *Theory:* As their Philoſophy was not tolerable, ſo their Anatomy was little better, and their Natural Hiſtory worſt of all; inſomuch, that they were almoſt deſtitute of the neceſſary *Præcognita* thereto. It is true, they all required, in a Student of Medicine, a Knowledge in Geometry and Numbers; and thought it indiſpenſably neceſſary to any one, who ſhould offer to diſpenſe a Drug, adjuſt a Compoſition, or give an Account of the Manner of the Operation of Medicaments; yea ſometimes we have a few Hints of the Application of theſe in ſome Caſes: Yet it cannot be denied, they made leſs Uſe of it than they might and ſhould have done, to the great Detriment of Medicine, as it is a *Science*. An evident Inſtance of this is the Circulation of the Blood, which, if they had but very little conſidered the Laws of Motion, and the Elements of Geometry, they could not have been ignorant of, as certainly all that are not bigotted muſt acknowthey were.

THOSE, betwixt the Antients and them of theſe two laſt Centuries, treated Medicine as all other Sciences were then uſed: They tranſlated, commented, and borrowed from the Ancients, and one another; made a great Pother about Words, and Tropes, and Metaphors; but, for the moſt Part, left the Science in no better State than they found it. It is true, there have been ſome great Men in all Ages, who have managed their Provinces with Skill and Addreſs: But it is certain, that Part of Medicine, we are now enquiring into, received but few Improvements in thoſe Days.

AFTER the Time of the Reſtauration of Letters, *Medicine* advanced proportionally with other Sciences; Anatomy was inquired into with good Succeſs by ſome; the Hiſtory of Nature, Philoſophy, and Chemiſtry, by others; ſo that, e'er this Time, the theorick Part of *Medicine* had arrived to a conſiderable Perfection, had not theſe two laſt, miſapplied, ſtepped in to hinder the ſame.

THE *Philoſophic Phyſicians* were ſo fond of their Syſtems, that every medical Appearance muſt do them Homage: All was reſolved into ſubſtantial Forms, Sympathies, and Antipathies, *&c.* or into ſubtile Æther, Congruities,

gruities, and Incongruities, *&c.* would they, nill'd they; not conſidering that the firſt of theſe is a mere Metaphor, *i. e.* in the preſent Caſe, Words without a diſtinct Meaning; and that the ſecond is plain Nonſenſe, unleſs theſe things naturally follow from the determined Laws of Motion; and, in a word, that all Natural Philoſophy, unleſs ſupported by Geometry, is but a pleaſant *Romance.*

THE *Chemical Phyſicians* were yet more wild to introduce their *Laboratories* into the Bodies of Animals; and to expect the ſame Effects from our Veſſels, as from their Retorts. Some of them have reſolved the Cauſes of all Diſeaſes into Acids, and therefore they muſt be cured by Alcalious Remedies: Others, by an oppoſite Extream, have reſolved Diſeaſes into theſe, and therefore they muſt be cured by thoſe. They have made a great Noiſe with their Fermentations, Effervеſcences, and the like; while, in the mean time, we are certain, that neither the one nor the other is in the right, and that the Heat of our Bodies is no ways able to produce the ſame Effect with their Furnaces; neither are we able to mix three or four different Liquors in a fine Glaſs Tube, much leſs can we expect ſuch Effects, as they aſcribe to their Fermentations, from the much more ſlender Canals of animal Bodies. I ſhall not offer at a formal Confutation of theſe different Ætiologiſts; the Matter has been done, or will be done, by much better Pens; but this in the general I may ſay, That allowing theſe Gentlemen all they crave, yet ſtill all is Nonſenſe, unleſs they firſt ſhew their Syſtems and Chemical Effects to be neceſſary Corollaries from the known Laws of Motion, *i. e.* unleſs all their Philoſophy, and Chemiſtry too, be firſt mechanically explained; which moſt of theſe Gentlemen do not pretend to.

Gallileo, *Torricelli*, and *Paſchal*, the firſt by Water, the other by Mercury, and the third from the Effects of one and the ſame Experiment at different Heights, brought to light theſe three grand Properties of the Air; (that Fluid, which is ſo abſolutely neceſſary, and ſo univerſally uſeful, both to the Being and Operations of Animals and Vegetables) to wit, its Elaſticity, Gravity, and circumambient Preſſure, which have ſerved in great ſtead toward the mechanical Explication of the animal Oeconomy. *Snellius* firſt found out the true Meaſure of the Refractions of Light, which ſerves to explain the Phænomena of Viſion: And ſeveral have ſhewn the Analogy betwixt the Motions of muſical Organs, and their Effects on the ambient Fluid, and the Vibrations of a Pendulum, whereby the Diverſities of Sound, and the Manner of Hearing, are explained.

Des Cartes, by a bold (not to ſay impious) Attempt, was the firſt (ſince *Prometheus* and *Democritus*'s Days) who endeavoured to create an Animal, *Magnis tamen excidit auſis.* But to be juſt to him, he was no mean Perſon; for, not to ſpeak of the Analytical and Geometrical Improvements, which are acknowledged to be his, (ſuch are the Solution of Biquadratic Æquations, the Analytical Inveſtigation of all *Loca*, the Expreſſion of the Natures of Curves by Æquations which renders them ſo manageable; the Geometrical Conſtruction of Æquations of all Degrees, the Determination of the Curves of Reflexion and Refraction (which had perfected Optical Machines as to the Theory, had not a wonderful Property of Light, ſince diſcovered, come croſs to it) the Manner of the Inveſtigation of which Three, the greateſt Men of this or any other Age, have lately thought it worth their Pains to ſhew: But above all, the Invention of a Method of Tangents, which was unknown to the World before; (and how comprehenſive the ſame Method is, *Hudde* and *L'Hoſpital* have ſhewn) I ſay, beſides all theſe, it was he who firſt baniſhed effectually the *Ariſtotelian* Jargon, and made Men reflect upon the natural Right they had to a Freedom of Thinking: And tho' for the moſt part he did ſubſtitute a bad Syſtem in its room, yet it was ſuch an one, as made Men reflect more upon the Neceſſity of applying

Geometry to Natural Philoſophy; but which is moſt for our preſent Purpoſe, he was the firſt who explained mechanically the Nature of Viſion, and the Conſtruction of the Eye: He has likewiſe given ſeveral conſiderable Hints towards the better Underſtanding of the Nature of Sound, how it acts on our Organs, and raiſes the ſeveral Paſſions, both in his other Works, and in his *Compendium* of Muſick; and tho' this laſt Treatiſe be unlicked and unſhapen, and never deſigned for the Public, as himſelf ſays, yet it has ſome few uncommon Touches not unworthy its Author.

BUT all hitherto done was only pickering, or rather ſtorming the Outworks of the *Theory* of *Medicine*; the Fort was ſafe and entire, till the noble *Harvey* gave it a fatal Shock in the Diſcovery of the *Circulation* of the *Blood*; a Diſcovery ſo wonderful, uſeful, and happy, that all Ages will admire and bleſs its Author; a Diſcovery ſo conformable to the Rules of Mechaniſm, and the Laws of Motion, and ſo fitted to that Geometry, the wiſe Director of Nature uſes in all his wonderful Works; in a word, a Diſcovery, which has let in more Light into the *Theory* of *Medicine*, than almoſt all the former joined together.

ABOUT this Time, *Steno* endeavoured to give an Account of the true Structure of uncompounded *Muſcles*, and to explain mechanically the manner of their Operation: And tho' he was miſtaken in both, yet by this Attempt, he reduced the Choices behind into a leſſer Number, and increaſed Mens Deſires to ſearch into the true Mechaniſm of theſe Wonders of Nature. He likewiſe publiſhed a Treatiſe, *De Solido intra Solidum*, wherein, beſides ſeveral uſeful things in Natural Philoſophy, there are ſome which have been ſince happily applied to that Part of *Medicine* we are now enquiring into.

Sanctorius likewiſe, in his admirable Treatiſe of *Statical Medicine*, has obliged the World with many excellent Rules of Health, and many uſeful Obſervations of the Quantities and Proportions of the ſeveral natural *Evacuations*, and the Effects of the Suppreſſions of theſe, whereby Men are enabled to talk more diſtinctly, and not left to gueſs at random about ſuch Things. It is to him, likewiſe, we owe the Invention of what is now called the *Thermometer*, whereby we are not only enabled to diſtinguiſh the ſeveral Degrees of Heat and Cold, to a much greater Exactneſs than formerly, by our bare Senſes, but likewiſe to prognoſticate ſomething about the Changes of the Weather; but which is moſt of all, we are thereby enabled to underſtand ſomething more than formerly, about the

Cauſe of the unnatural Aſcent of the nutritious Juices in Plants and Vegetables.

AT laſt came out that ſurprizing Piece of *Borelli*'s *De Motu Animalium*, giving the true Mechaniſm of the external Motions of Animals, and forward Advances in that of the internal Motions: For him was reſerved the great Honour of augmenting the Number of Sciences by one; one, the nobleſt and moſt admirable that ever human Wit invented! For, by a vaſt Skill Mechanicks, and a wonderful happy Subtilty of Genius, he not only invented, but, himſelf alone, almoſt perfected that Science; a piece of good Fortune, which ſeldom ever happened to one and the ſame Perſon. His firſt Part of the external Motions is perfectly charming, inſomuch, that nothing fuller and more compleat can be deſired on the Head. It is true, the moſt ingenious *John Bernoulli*, the worthy Profeſſor of Mathematics at *Groningen*, (from a Property of Fluids, and a Method of Inveſtigation, which was not known to *Borelli*) has given the Grounds of a much exacter Calculation of the Elevation of the *Pondera* from their given Reſiſtances, and the Dilatations of the *Machinulæ* which conſtitute the diſtractile *Fibres* of the *Muſcles*, than *Borelli*'s, in the XCVIIIth Propoſition of his firſt Part; and has likewiſe drawn many ingenious Corollaries from that Speculation, determining the Curve theſe *Machinulæ* would deſcribe, by a Section through their Direction, and the Proportions of the *Liquidum Nervorum*, or, as he calls it, the *Aura motiva* to the *Pondera elevanda*. But it muſt be granted, *Borelli* has made the beſt uſe of all the Geometry known in his Days of any who went before him. In his ſecond Part, he has many admirable Propoſitions for calculating the Force of the Heart, and the *Impetus* which the Arterial Blood receives from it, the determining the Neceſſity of its given Structure, the Manner, Nature, and Uſe of Reſpiration; beſides many uſeful Hints for the Diſcovery of the Motions and Natures of the Fluids of the Body. But it muſt be confeſſed, this Part is not near ſo compleat as the other: Some of the Motions of the Fluids, and the Natures of the Canals, were things not manageable by his Geometry; and he neither had ſo perfect a Skill in the *Practical* Part of *Medicine*, nor was Anatomy ſo fully diſcovered as now to compleat that Part.

HIS noble Diſciple *Bellini* has taken up the Science where he left it. He, by an exact Skill in Anatomy, a perfect Knowledge in the *Practical* Part of *Medicine*, a nice and true Obſervation of the leſs common Effects of Nature, and a good Underſtanding in the Mechanical Philoſophy, has much improved that Part of the internal Motions of Animals: He has nicely diſtinguiſhed the Natures and

Differences of Urines and Pulſes; He has juſtly explained the Effects of Blood-letting in ſeveral ingenious Propoſitions: He has handled the general Cauſes and Diſtinctions of Fevers; the Manner of the Operation of ſome Medicaments, the Diſeaſes of the Head and Breaſt, after a Manner no leſs uncommon than genuine; whereby he has put a quite new, but natural Face on Medicine, and reduced it pretty near to a Science, which was before but a Trade. There are ſeveral uſeful and ingenious Propoſitions in his late Book, about the Motion of the Heart, the Blood, and the other Fluids; the Manner how to diſcover the Tendency of the Fluid from the Figure of the Canal given, a Confutation of the *Chemical* Fermentations in Secretion, and an Illuſtration of his former Treatiſe about Blood-letting. But in my Opinion, the nobleſt and moſt admirably uſeful Part of his whole Works, is that about the true Structure of the *Glands*, and his Hints about the Laws and Manner of Secretion. It is a great Pity, that he has not, or will not explain this more fully himſelf; for I reckon it, and the *Circulation* of the Blood, to be the Key, whereby the *Geometria recondita* will have admittance into, and let in an *Ocean* of Light to theſe dark internal Regions.

OUR Countryman, Doctor *Pitcairne*, has admirably illuſtrated this Part, ſo far as the

Labour of conſtant Teaching in one Place, or the Hurry of a toilſome Practice in another could allow; He has demonſtrated the genuine Nature of the *Circulation* of the Blood, by ſhewing the neceſſity of the Continuity of the Veins to the Arteries: He has ſhewn the Mechanical Structure of the Lungs, and thence the neceſſary Effects of Reſpiration; He has aſſigned the Organs their Force and Nature, and the true manner of Digeſtion, and freed us from the Fury of a corroding *Menſtruum:* He has demonſtrated the neceſſity of Obſtructions rather happening in the Arteries than in the Nerves, and in the Nerves rather than Veins; and how theſe Obſtructions are produced: He has demonſtrated the Evacuations proper in Fevers, and the Cauſe and Nature of the Diſeaſes of the Eye: He has baniſhed effectually the plauſible Congruity of Pores in Secretion, the ridiculous Cant of Acids and Alkali's, and the whimſical Fancy of Ferments; beſides many other noble Hints, which his manly *Laconic* Eloquence has left undetailed to the Sagacity of the attentive Reader.

BESIDES all theſe, ſeveral Gentlemen of the *Royal Society* at *London*, (which did caſt the firſt Copy to the reſt of *Europe*) and of the *Royal Academy* of Sciences in *France*, and of ſeveral other Philoſophic Societies, have diſcovered many uſeful Theorems, and made many noble Experiments, toward the Illuſtration of the Mechanical *Theory* of *Medicine*, which are never ſufficiently to be admired or commended.

THESE are the Men, and this is a ſhort Account of what they have done, ſo far as I know or remember, toward the *Theoretic* Part (at leaſt, toward what I think deſerves that Name) of Medicine. A great many Noble Things this way they have done, and many conſiderable Difficulties they have overcome: But it cannot be denied, there ſtill remains an ample Field for the Induſtry of the preſent and future Ages. It would ſuppoſe that one knoweth (which God knows I do not) all that has been hitherto diſcovered, and that he were almoſt able to ſupply the Remainder, to give a particular Account of what is wanting in this Part: However, I ſhall venture to give my Opinion of ſome things which are evidently deficient.

I. THOUGH I think the greater, and more eaſily conſpicuous Organs and Parts of Animals and Vegetables, be entirely diſcovered by the Induſtry of ingenious Anatomiſts of our *Iſland*, and thoſe of other Countries; yet I think we have not, as yet, ſo compleat an Inſpection into the more minute and leſs obvious Parts of theſe, which muſt be abſolutely neceſſary toward a compleat Theory of Medicine: We have not, as yet, traced the Continuation of the Arteries, Veins, and Nerves, ſo far as they go, not ſo far as I hope they may be traced: We have not, as yet, a perfect Diſcovery of the Texture of the Brain in all its Parts: We have not, as yet, been able to evolve the compounding Veſſels of any more Glands, than the Inteſtines and *Teſticuli*: We want the true Texture of the *Liver*, *Pancreas*, *Spleen*, *Kidnies*, and all the other Conglobulous and Conglomerate Glands: We have not diſcovered the Texture and Range of the Veſſels under the *Cuticula*. But, which is worſt of all, we have not, as yet, determined the true Situation, nor Poſition, the Windings and Branchings, the Angles they make with one another, or the Curves they deſcribe, of moſt of the known and viſible Canals, which might be eaſily done. The Anatomy of Human Bodies is as yet very imperfect, and our *Comparative Anatomy* is quite lame: Beſides, a Thouſand other Things which might be here added, which are neceſſary to a true Theory; for unleſs our Theories and Obſervations confirm one another, they will be ſtill little more than the moſt probable Conjectures. The Performances of *Malpighius*, Dr *Grew*, *Lewenhoeck*, and others, as to this deficient Part, are very well; but ſtill there are here many things deſirable, which I hope are reſerved for ſome of theſe, or others, endued with a dextrous Hand, a quick Sight and Obſervation; aſſiſted with fine Microſcopes, and a good Skill, both in the common and more abſtruſe Geometry.

II. WE evidently want a compleat *Hiſtory* of *Nature*, *i. e.* the Names and Natures, the Diſtinctions and Properties, of the Animal, Vegetable, and Mineral Kingdoms. It is true much has been done already, and ſtill is a doing, this way, by the noble Members of Philoſophic Societies, and other private Perſons; yet ſtill very much is wanting. And till that Part of it, which is neceſſary in Medicine (and how far that may extend none can tell) be perfected, we cannot expect a compleat Theory thereof: For all know how uſeful a perfect Skill in the Nature and Virtues of the Remedies, is, to the full underſtanding the Diſeaſe, and the manner of its Cure.

III. WE want a compleat Syſtem of Mechanic Philoſophy, *i. e.* an Account of all the viſible Effects of Nature upon Geometric Principles; for it is not Syſtems, as they are an Explication of all the Effects of Nature from the ſame Principles, which are ſo juſtly ridiculed, but Syſtems, as they are ungeometrical. It is true indeed, all the great, viſible, conſtant and uniform *Phænomena* of Nature, have been attempted by the eminent Mathematicians of this and the laſt Age, but accounted for, from rigorous Geometry, by that ſtupendiouſly Great Man, Sir *Iſaac Newton*, *Quem ſecula*

ſecula nulla tacebunt: He has not only given the true Cauſes of theſe *Grand Appearances*, the Laws of Motion, and the Nature of Fluids, the Nature of Light and Sound, the Manner and Rules of their Propagation; in a Word, all the general Mathematical Principles, whereby to examine the Pretenſions of different Syſtems, and many new ſurprizing Problems and Theorems in the ſpeculative Part of Geometry; but he has likewiſe diſcovered the true Principle of all the Effects of Nature, to wit, Attraction, or Gravitation: But, which is moſt of all, to him we owe the only Key whereby the Secrets of Nature are unlocked, to wit, the general Way of managing Æquations, the Methods of *Infinite Series's*, and of *Fluxions*, direct and inverſe; Examples of which, his whole *Principia* are. This is that which will bring *Analytics*, *Geometry*, *Natural Philoſophy*, and the *Theory of Medicine*, to their utmoſt Perfection, if ever they get thither: By theſe we are able to contract all the Myſteries of the Ancient and Modern Geometers into the room of a few Lines, and diſcloſe them with a few Scrapes of our Pens; of which, when People ſee the Concluſions without knowing theſe Methods, they look like conjuring, or ſomething above the Capacity of Men. Yet, after all, theſe Methods have not as yet been applied to the leſſer, leſs obvious, leſs conſtant, and leſs uniform Effects of Nature, of which we are principally ſpeaking here, and which are ſo abſolutely neceſſary to a true Theory of Medicine: And though I am perſuaded, that from the ſame Principles the grand Appearances of Nature have been accounted for, theſe more minute ones may be ſo too; yet it is what has not been actually done, and without which we ſhall be ſtill ſtraitned in our Theories. We want to know the Mechanical Account of Chemical Operations, and Preparations of ſeveral ſorts; which is a vaſt Defect: We want to know ſomething more about the Nature of Fluidity, and what it is makes up the many Varieties and Differences of Fluids from one another; the Figures of their conſtituent Particles, and a compleat Collection of the Laws of their Motions: We want to know the true and adequate Nature and Cauſe of Heat and Cold, and the Reaſon of their odd Effects: We know not the Figures of the Particles of Bodies which which produce ſuch Varieties of Taſtes: We want to know the Figures of the Particles of Bodies, which naturally form themſelves into ſuch and ſuch Shapes, after the manner *Huygens* has analyſed Iſland Chryſtal; this would be of mighty uſe toward the full underſtanding of the Natures of all Saline Bodies, which generally form themſelves into determined Figures: We do not, as yet, underſtand the Principles of *Individuation* (if I may ſo call it) of one kind of Body from another; Why ſome have ſuch Grains, Colours, and Shapes, others different: We know not the true Nature and Cauſe of *Elaſticity*, which is of ſo great Extent in the Animal Oeconomy: We want to know a great deal more about Light and Colours, Opacity and Tranſparency, though we hope to receive Satisfaction therein ſhortly, from that great Perſon, who has ſo dearly obliged the World already. Theſe, and a Thouſand other Things, we want, which he only can enumerate, who could ſupply them: And though we have many and noble Hints in moſt of theſe, from *Borelli*, Sir *Iſaac Newton*, and ſome other Mathematicians, yet we have not ſo perfect a Knowledge of them as might be deſired, and, as I hope, may ſome Day or other be obtained.

IV. Laſtly, We want a *Principia Medicinæ Theoreticæ Mathematicæ*: Albeit the Theory of Medicine and Natural Philoſophy be nearly allied, and though the lately mentioned great Man has almoſt compleated the latter, yet he did it not with that View to be mainly ſubſervient to the former: And though *Borelli*, in his excellent Book, *De Vi Percuſſionis & de Motu Naturæ à Gravitate factis*, has demonſtrated ſeveral things uſeful to that Purpoſe, yet he concerned himſelf mainly but with thoſe things which he thought neceſſary to the underſtanding of his Book, *De Motu Animalium*: So that, notwithſtanding both theſe, we have not ſuch a Book as I reckon this ſhould be. Such a Book (among many other things, which I am not capable to enumerate) ſhould at leaſt contain theſe things: 1. It ſhould contain the true Nature of Fluidity, wherein it conſiſts, and what it is that makes one Fluid differ from another, the Figures of their conſtituent Particles, and why there are Solids of ſuch and ſuch determined Shapes, naturally generated in each particular Fluid; the general Laws of the Motions of all Fluids, and the particular ones of each different Kind, whether homogeneous and uniform, or a Mixture of ſeveral different Kinds. 2. It ſhould contain the Nature and Cauſe of Elaſticity, and the Figure of the conſtituent Particles of Elaſtic Bodies, and the Laws of the Percuſſions and Reflections of ſuch; the Curve, into which Elaſtic Bodies naturally form themſelves, when bended, if they obſerve one conſtant Law, *i. e.* if the Tenſion be always proportional to the bending Force; or the ſeveral Curves they muſt deſcribe; if different Elaſtic Bodies obſerve different Proportions, (as *James Bernoulli* has done) which would be infinitely uſeful in the Theory of Medicine. 3. Since it is certain now, that Glands are nothing but a Complication and Circumvolution of the Arteries into Curves of ſuch and ſuch Natures and Numbers, or into *Plicæ*, whoſe Turnings are Curves, or make right-lined Angles of ſuch and ſuch Quantities: Such a Book ought to determine the Effects ariſing in the Fluids, as to the Acceleration or Retardation of their Motion, their Viſcidity or Fluidity, the Comminution or Augmentation of that of their conſtituent Particles, when moved in Canals turned and complicated, into all poſſible curve or right-lined Figures; and what Effects would ariſe in the curved Canals themſelves, as to their Elaſticity or Diſtractility in being turned into ſuch and ſuch Curves. I imagine it is ſome ſuch thing as this, which *Gulielmini* promiſes in the Preface of his Treatiſe, *De Aquarum fluentium menſura*; For we know the Laws of the Motions of Fluids in direct Canals already. This would be a Work of vaſt Labour, but of noble Uſe; and we know not but general Methods might be fallen upon to alleviate the Labour of the Calculations. Sir *Iſaac Newton* has given one Theorem in two Lines, which, if rightly managed, will give the Quadratures, Rectifications, Surfaces, Solidities, Centers of Gravity and Percuſſion, or Oſcillation of all imaginable Curves and Solids whoſe Natures can be expreſſed by any Analytical Æquation whatſoever. I know of ſomething like the ſame done for all Curves and Solids, whoſe Natures are expreſſed by Tranſcendent or Exponential Æquations, *i. e.* ſuch as he calls *Geometricè Irrationales:* And perhaps both theſe laſt may be compounded into one, and conſequently comprehend the firſt likewiſe. Now, if ſuch general Methods were fallen upon, for theſe which we are ſpeaking of, it would ſave a great deal of Calculation, Reading, and Writing; and why it may not, I ſee no Reaſon to doubt. 4. It ought to contain a Calculation or Determination of what Effects the Fluids would have upon one another, and upon Canals formed into ſuch Curves, upon an Augmentation or Diminution of their Quantities, an Acceleration or or Retardation of their Motions, the Increaſe or Diminution of their ſpecific Gravities, or of the Bulk and Figure of their conſtituent Particles; or the Alteration of their Fluidities, or Viſcidities. 5. It ſhould contain what Effects ſolid Particles of all Figures, Sizes, and different Gravities, mixt with Fluids of all kinds, would have upon the Fluids themſelves, or upon the diſtractile Canals of ſuch and ſuch Figures. 6. Laſtly, it ought to contain the final Cauſes, and the Mechanical Neceſſity of the given Figures of the more ſolid Parts of the Body: Why ſome Glands are Conglobous, others Conglomerate, as they are called; Why the Teſticles reſemble a Spheroid, generated by the Circumvolution of the Semi-ellipſis about its longeſt Axis; and the Heart, one generated by the Circumvolution of a Semi-ellipſis about a Diameter oblique to its longeſt Axis, or at an Angle of 45 Degrees with the ſame. Why the Muſcles, ſome of them are of one Figure and Texture,

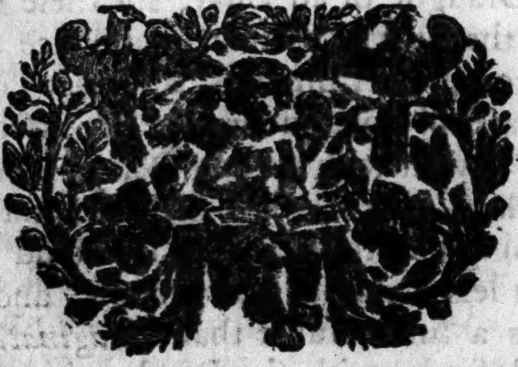
ture, ſome of them of another; ſome ſituated near the Part to be moved, others at a greater Diſtance from it. Now, though many of theſe things, here mentioned, are to be found already accounted for, and demonſtrated in the Writings of the Geometers of this Age: Yet one, who profeſſedly deſigned to treat of theſe things for the Benefit of Medicine, ſhould either tranſcribe them out of theſe, or demonſtrate them a-new after his own Method, that we might have all that belongs to this Subject together in one Book.

BUT after all, perhaps, it may be ſaid, ſuch a Chimerical Piece as this, toward which there are required ſo many hard (not to ſay impoſſible) things, will never be written by all the Wit of Men. To this, I anſwer, That there are very great Advances towards ſuch a Piece already made, and if a few ingenious Men, endowed with a perfect ſkill in the Abſtract Geometry, and the new Methods of Inveſtigation, ſhould but manage this Province after the manner we formerly ſhewed Aſtronomy had been treated, each improving the Diſcoveries of the other, the one beginning where the other had left off; I doubt not, but theſe I have mentioned, and harder things too, might be brought to paſs: And if once ſuch a Book as this was finiſhed, and the other neceſſary perquiſites ſearched into, Medicine in a ſhort a ſhort time might be brought to the immediate Confines of Demonſtration.

THERE are two things, which would mightily conduce towards the perfecting ſuch a Work as this of the *Principia Medicinæ Mathematica*. The firſt is, the publiſhing ſomething concerning the *Inverſe Method of Fluxions*, or as the *French* call it, *La Methode de Calcul integrant*; which might contain the Application thereof to all the intricate Problems of Geometry, and give general Canons for the Solution of all ſuch, and likewiſe general Precepts for the Application of the ſame to Mechanic and Natural Philoſophy, with the Illuſtration of them by many particular Examples from Sir *Iſaac Newton*'s *Principia*, and the noble Problems ſolved within theſe twelve Years, and publiſhed in the *Philoſophical Tranſactions*, *Acta Lipſiæ*, and *Journals des Sçavans*. For though a Man with a great deal of Pains may gather the Materials of ſuch a Book, from Scraps here and there, yet they are few who have ſo much leiſure, or, if they have, will give themſelves the trouble; or, if they could do both, have the Convenience of ſearching into ſo many different Books, to gather up what is neceſſary to furniſh them with a tolerable Knowledge of this wonderful Method: And therefore it would be of great Uſe to the World, and to the Improvement of

Learning in general, that a Book containing, at leaſt, all that is already publiſhed on this Head were compiled and ſet in a clear Order. It is true, the noble *Leibniz* has promiſed ſuch a Book as this, but I am afraid his great Employment will deprive us too long of that Advantage: Beſides, I doubt he will not condeſcend to the Capacity of the lower Rank of Geometers, for which ſuch a Book ſhould be principally deſigned. *Carre* indeed has given the firſt Rudiments of ſuch a Work, but he is ſo far from giving an Account of all that is publiſhed this way already, that I am afraid he has not underſtood them himſelf, his Performances on that Head being ſo very low. A ſecond Thing, which would very much conduce toward the Work we were ſpeaking of, is, that the great Geometers of this preſent Age would be pleaſed to publiſh thoſe many noble Secrets of Geometry and Philoſophy, which, to the great Detriment of Learning, they think fit to conceal: What Reaſons they have for doing ſo, they know beſt themſelves, but I am ſure it would be a greater Honour done to themſelves, and a greater Advantage to the Age they live in, and in particular to the Mathematics, to communicate to the public ſuch things, as they know have not as yet been made common, than to keep up the Method, now in Vogue among ſome, of propoſing hard Problems, (which are at leaſt ſuppoſed, known by the Propoſers,) to employ the Time of others, which might be laid out on Things as yet unknown: This would put an end to the Contentions about the Honour of Inventions, and prevent the melancholy Diſappointment ariſing from finding out excellent Things, and yet not to be reckoned the Inventors of them. There could be no greater Encouragement for an ingenious Man, than to be ſure he ſhould not beſtow his Time in vain, if he were ſucceſsful in his Deſign; that is, to be ſure he is not already prevented.

THUS I have frankly given my haſty Thoughts about Things of very great Importance: But I hope the candid Reader will more eaſily pardon the many Eſcapes of this rude Draught of an Eſſay, for theſe Reaſons. Firſt, that it was written in a Place deſtitute of all common Aſſiſtances, and that I could be at no eaſe till it was done, the Bookſeller preſſing to have it without any Delay: And in the next Place, that if ever I ſhall be betrayed into publiſhing any thing again, it ſhould be on a Subject leſs obnoxious to wrangle, and where there is a ſurer Guide than *Imagination*. For to deal freely with the Reader, it was out of mere Indignation that I put Pen to Paper on this Subject, having ſeen it ſo unſkilfully managed by two of our own Phyſicians here in Town, who ſome time ago played at *Loggerheads*, about Vomitting in Fevers. I owe them thanks, for the many good Words, and a few good Offices they have ineffectually endeavoured to do for him whom they ſuſpected to be the Author (how far their Kindneſs would have extended itſelf toward him, who is the Author, indeed had they known him, we may eaſily gueſs); however, all that I ſhall ſay of them, is, that the one (that Enemy to all Schemes, Figures, Senſe, and Demonſtrations) had a bad Cauſe, and defended it moſt wretchedly: And that the other, having imitated the Practice of better Phyſicians was not ſo happy as to imitate their Reaſoning, but ſpoiled a good Cauſe by bad Arguments.



A NEW THEORY OF *Acute and Slow Continued* FEVERS.

A NEW THEORY OF *Continual* FEVERS.

POSTULATA.

1. THAT the whole Body is nothing but a Congeries of Canals, the greateſt (at leaſt a conſiderable) Part of which is *Glands*, properly ſo called, deſigned for the Separation of ſome Fluid.

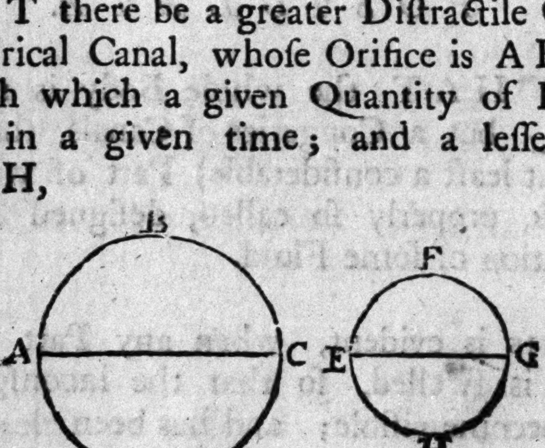
THIS is evident, when any Part of the Body is ſwelled, ſo that the inconſpicuous ones become viſible; and has been clearly demonſtrated by *Malpighius*, *Leuwenhoeck* and others.

2. That when a Machine is diſordered, if we ſhould ſee it righted by adjuſting ſuch a particular Part, we might without Scruple affirm, that it was ſome Injury done to that Part, which had diſordered the Machine; eſpecially, if after the whole was taken to Pieces, we ſhould find them all ſound, ſave that particular one.

Thus, if we ſhould ſee a Watchmaker, by adjuſting only the Ballance of a Watch, make it go right; we might ſay the Diſtortion of the Axis thereof had occaſioned it's going wrong; eſpecially, if all the other Parts be found as they ſhould be.

LEMMA I.

LET there be a greater Diſtractile Cylindrical Canal, whoſe Orifice is ABCD, through which a given Quantity of Liquor paſſes in a given time; and a leſſer one EFGH,



through which a proportionable Quantity of the ſame Liquor paſſes with the ſame Celerity as in the former: Let now the greater A B C D be increaſed or diminiſhed by the leſſer E F G H, ſo as that in the increaſed or diminiſhed Cylindrical Canals, the ſame Quantities only paſs, which paſſed in the ſame Time in the firſt ſuppoſed Canal, A B C D: To find the Quantity of the ſame Fluid, which will diſtract (and produce the other Effects of increaſing the Quantity of the paſſing Fluid, and conſequently its Celerity) the Canal (by increaſing its Diameter) firſt ſuppoſed, ABCD, after the ſame Manner, only that the increaſed (A B C D + E F G H) or diminiſhed (A B C D — E F G H) Canals are now diſtracted.

LET the Quantity which in the firſt Suppoſition paſſes through the Canal A B C D be called a, and the Quantity which paſſes through the Canal E F G H be called b: Since in the firſt Suppoſition the Celerities are the ſame in both, their Orifices will be as a and b reſpectively. Likewiſe the increaſed and diminiſhed Canals (ſeeing their Altitude is ſuppoſed the ſame) will be as their Orifices $a+b$, and $a-b$; and the Quantities paſſing through them in the ſame time, with the ſame Celerity, would be likewiſe as $a+b$ and $a-b$: But (in the ſecond Suppoſition) the ſame Quantity is ſuppoſed to paſs in the increaſed Canal $(a+b)$ and diminiſhed one $(a+b)$ which paſſed in the firſt ſuppoſed Canal A B C D, or a; therefore now the Quantities paſſing through the Canals, increaſed or diminiſhed, will be as a : wherefore, as $a+b$, (the Quantity paſſing through the increaſed or diminiſhed Canals in the firſt Suppoſition) is to a; (the Quantity paſſing through them in the ſecond Suppoſition) ſo is b, (the Quantity paſſing through the leſſer Canal E F G H, in the firſt Suppoſition) to $\frac{a\,b}{a\pm b}$, the Proportional Quantity which paſſes through and will diſtract the leſſer Canal E F G H, after the ſame Manner that the increaſed or diminiſhed Canals are diſtracted in the ſecond Poſition. Adding or ſubſtracting this Quantity from a, (which is as the Quantity paſſing through, or diſtracting the increaſed or diminiſhed Canals) the Sum or Difference $a \pm \frac{a\,b}{a\pm b} = \frac{a\,2}{a\pm b}$ will be as the Quantity which will diſtract the firſt ſuppoſed Canal A B C D after the ſame manner, *&c. q. i. e.*

SCHOLIUM.

THE whole Canals of the Body, (ſave the Inteſtines and Lacteals) may be conſidered as a concave Cylinder, whoſe Baſe is the Orifice of the Aorta at its exit from the Heart; and whoſe Length is a mean Arithmetic Proportional betwixt the longeſt and ſhorteſt Artery (I mean the whole Length of the Artery till it degenerate into a Vein; for the Length of the Veins are of no Conſideration here) it being their ſplitting into Branches, which makes them not Cylindrical. Now, by *Poſtul.* 1. the Veſſels which make up the *Glands* may have any Proportion of Minority to the whole of the Canals; ſuppoſing then an Obſtruction or Dilatation of the *Glandular* Veſſels, it is evident the foreſaid concave Cylinder will be thereby diminiſhed or increaſed in any given Proportion: Suppoſe, *e. g.* the Diameter of the Cylinder ſo obſtructed is to that of the whole, as 1 is to the $\sqrt{2}$; their Orifices will be as 1 to 2. Suppoſe again, there are twenty Pounds of Blood in a Man, ſeeing at the Beginning of the Arterial Veſſels, (which conſtitute the Glands) the Velocity is near the ſame, as proceeding from the ſame Cauſe, the Compreſſion of the Heart: Therefore divide 20 into two Parts, which may be (in this Caſe) as 1 is to 2; (which is done by this general Rule $x = \frac{md}{m+n}$, $y = \frac{nd}{m+n}$ putting d for the 20 Pounds, x for the greater, and y for the leſſer proportional Part, m to n their *Ratio*) the Parts will be here $6\frac{2}{3}$, and $13\frac{1}{3}$; which are the proportional Parts of 20 Pounds of Blood, which would naturally paſs in the obſtructed Canal, and in the Remainder thereof, which is paſſable. But if all the 20 Pounds muſt now paſs in the paſſable Canals, then it will be diſtracted as much as if the whole Canals were paſſable; but that 30 Pounds of Blood were forced through it in the ſame time by the preceding Lemma. For in this Caſe $a = 20$, $b = 6\frac{2}{3}$, $a - b = 13\frac{1}{3}$; and therefore $\frac{a\,a}{a - b} = 30$. If the Orifices were as 1 to 3, then $b = 5$, $a - b = 15$ and $\frac{a\,a}{a - b} = 26\frac{1}{3}$ this ſuppoſing an Obſtruction. If there be a Dilatation ſuppoſed in the ſame Proportions, then $\frac{a\,a}{a + b}$ will be in the firſt Caſe 15, in the ſecond 16. The ſame may be applied to the *Liquidum Nervorum*, which paſſes in the Nervous Canals: For the *Gland* conſiſts of a complicated *Nerve* as well as *Artery*, and in an Obſtruction, or Dilatation of the ſame, both *Artery* and *Nerve* are ſuppoſed to be obſtructed or dilated.

The Deſign of all this is to ſhew, that in an Obſtruction or Dilatation of the Veſſels, it is the ſame Thing as if the Liquors therein contained were augmented or diminiſhed in a certain Proportion; as in the Caſe of the Blood-Veſſels, ſuppoſing 20 Pounds of Blood, (which is the ordinary Quantity) in a Man, and ſuppoſing one half of the whole (by an Obſtruction in any Place of the ſaid) Veſſels were rendered impaſſable, it is the ſame thing *quam proximè*, as if the whole Blood-veſſels were paſſable; but that one half more of Blood were forced through them in the ſame time, in which the 20 Pounds paſſed. Of the ſame Nature is

LEMMA 2.

THE Blood being ſo corrupted, that the Strength is impaired or increaſed, it is the ſame thing as if it were in its natural State, but that the Quantity thereof were diminiſhed or increaſed in ſuch a Proportion as is neceſſary for producing this Increaſe or Decreaſe of Strength.

THIS is the *49th* Prop. of *Bellini*'s Book *de Motu Cordis*, &c. and its Converſe: The Propoſition it ſelf is there demonſtrated, and its Converſe may be demonſtrated after the ſame Manner exactly.

WHAT is here ſaid of increaſing or diminiſhing the Strength, is likewiſe true of all the neceſſary Effects of leſſening or increaſing the Quantity of Blood. Theſe things premiſed, I come to

THE
General Propoſition.

THE general and moſt effectual Cauſe of all Fevers, is the Obſtruction or Dilatation of (the complicated *Nerve* and *Artery*, *the excretory Duct and conſervatory* one, or rather all theſe; which, as ſhall be afterward ſhewn, make up) the *Glands*, and they receive their Denomination, as theſe or thoſe *Glands* are more or leſs obſtructed or dilated.

OTHER Things may concur, but theſe are the moſt powerful Cauſes.

IT were a Work of more Time and Pains than I can at preſent beſtow, to apply this Propoſition to all particular Kinds of *Fevers*; though I am ſufficiently ſatisfied it will account for all. I ſhall here only (as an Earneſt of the reſt) ſhew how to apply it to Continual *Fevers*, and therefore contract the General into

THE

Particular Propoſition.

THE moſt effectual Cauſe of continual *Fevers*, is an Obſtruction of the *Glands*, which will neceſſarily augment the Quantity of the Blood and *Liquidum Nervorum*, in the paſſable Canals, and perhaps (by the Stagnation of the Fluids contained in theſe) ſo vitiate their Nature, as that they may be reckoned to concur as a partial Cauſe of theſe *Fevers*: But I rely moſt on the firſt, to wit, the Augmentation of theſe Fluids. For a Demonſtration of this, I ſhall firſt ſhew, how it accounts for all the Appearances of ſuch *Fevers*, and then ſubjoin ſeveral Arguments to confirm the ſame.

SUPPOSING the *Glands* obſtructed; the Quantity of the Blood in the *Arteries*, and the *Liquidum Nervorum* in the *Nerves*, may thereby be ſuppoſed augmented in any given Proportion of Minority to the whole Maſs of theſe Liquors, *per Lemma* I. and its *Scholium*. Wherefore it will hence follow,

§. 1. THAT the Pulſes muſt be ſtronger and more frequent than ordinary, upon theſe Accounts. 1. Seeing there is a greater Quantity (than ordinary) of Blood in the *Arteries*, the Lateral Preſſion will be ſtronger; and ſeeing the *Arteries* are diſtractile, they will be driven outward with greater Force, and make a ſtronger *Ictus* upon any thing applied to them. 2. Seeing the Quantity of the Blood is augmented, *i. e.* the Quantity of the Matter whence the *Liquidum Nervorum* is generated, there muſt be a greater Plenty thereof *(per poſter. part. Lemm. 2.)* generated, and conſequently it will flow more plentifully and more quickly into the Heart, and make it contract oftner and more violently. 3. By the Obſtruction of the *Glands*, the Influence of of the *Liquidum Nervorum* thereinto is likewiſe obſtructed; and therefore, *per Lemm.* 1. there will be a greater Quantity thereof left to flow in the paſſable *Nerves*, and it muſt flow *qua data porta*. 4. Laſtly, The *Arteries* on every Side, running upon and touching the *Medullar* Subſtance and *Fibres* of the Brain, will (they being more than ordinarily diſtended) preſs them more than ordinarily, and make a more powerful and plentiful Derivation of the *Liquidum Nervorum* into the Places whither it can flow.

§. 2. FROM the ſame Cauſe the Inequality or Interruption of the Pulſes is evident: For if the foreſaid Preſſions upon the *Nervous Fibres* of the *Brain* be ſo ſtrong, that it either partly or *totally* occludes the Paſſage of the *Liquidum Nervorum*; there muſt be a Stop in the Derivation, till there be ſuch a Quantity thereof collected, as ſhall be ſufficient to over-power the *Impedimentum* occaſioned by this Preſſion, and ſo make an Inequality or Stop in the Contraction of the Heart. Moreover, when the Blood flows in ſuch Plenty, and with ſuch Violence from the *Auricles* into the *Ventricles* of the Heart, it may force its way before the *Ventricle* be entirely contracted, and thereby cauſe an Irregularity in the Pulſe. Add to theſe, what may proceed from the Thickneſs of the Blood (it being contracted into a leſs Space) and Evaporation of its Humidity. All theſe, either ſingly or compounded, will account for the Irregularities of the Pulſes, which have hitherto been obſerved.

§. 3. GREAT Pains in the Head muſt enſue from the violent Diſtractions of the tender Veſſels of the *Brain*, and from the the great Preſſure of the extended *Arteries*, upon the *Fibres* and *Membranes* thereof, all the Canals of every kind being ſwelled with their reſpective Liquors; and that being the moſt ſenſible Place.

§. 4. A violent and burning Heat muſt be felt upon theſe Accounts, 1. Becauſe there is a greater Quantity than ordinary running in the paſſable Canals, there muſt be a greater Motion than ordinary, and conſequently a greater Heat. 2. Merely upon the Account of the increaſed Quantity, (without conſidering the thereby produced greater Velocity) there muſt be felt a greater Heat. For ſuppoſing the Heat in each ſingle Particle to be the ſame as before; yet ſince the Particles are more numerous in the ſame Place, the Heat muſt be greater there too: As in Rays contracted by a *concave Speculum*. 3. The *Glands* being obſtructed, *i. e.* the Paſſages of Perſpiration, the natural Heat muſt thereby be kept in, and conſequently the whole augmented *per Lem.* 1. Hence proceeds our unquenchable Thirſt; the Humidity (*i. e.* the thinneſt Parts) being more ready to evaporate (ſince now the ordinary Paſſages are obſtructed) the reſt muſt be proportionally dryer.

§. 5. The Difficulty and Frequency of Reſpiration, and the Violence of Expiration, is hence eaſily accounted for: The Quantity of Blood being augmented, there muſt a proportional greater Quantity thereof be derived into the *Arteries* of the Lungs; and ſince every one of the little Veſicles of the *Bronchi* lie betwixt two *Arteries* thus inflated, it will be harder to explicate theſe Veſicles; and therefore one in ſuch a State will naturally with all his Force endeavour to ſuck in the Air, which will be forced out again, both by theſe inflated *Arteries*, and by the Force of the *Muſcles* of the *Breaſt*, *Diaphragm*, and *Lungs*; which is vaſtly augmented, both by the greater Quantity of Blood, and of the *Liquidum Nervorum*, and its more plentiful Derivation; as has been ſhewn, in §. 1. about the Frequency and Strength of the Pulſes.

§. 6. THE Tongue is rough and diſcoloured, becauſe, by the violent Motion of the Blood, and the Obſtruction of the common Paſſages, the Humidity is evaporated, and the extraordinary Heat ſtiffens the *Fibres* thereof. For it is evident, that only Heat and Dryneſs diſcolour the Tongue. *Vide* §. 4.

§. 7. WANT of Sleep muſt follow both: Becauſe there is ſuch plenty of Blood, and conſequently of the *Liquidum Nervorum*, (as is ſhewn, §. 1.) that there is no need of Sleep to generate more, which is one principal Uſe thereof: And becauſe of divers Diſorders of the Head (accounted for §. 3.) which will not allow that Tranquillity which is neceſſary to bring it on; but moſt of all, becauſe (by the plenty of the *Liquidum Nervorum*) all the *Muſcles* both involuntary and voluntary (eſpecially thoſe who want *Antagoniſts*) are in continual violent Motions, which muſt neceſſarily hinder Sleep.

§. 8. Ravings proceed from the Diſorders in the Head, accounted for §. 3. The *Nerves* being diſtracted by the abundance of their Liquor, the Heat and Dryneſs of their Parts, cannot perform theſe Reciprocations which are neceſſary in ſound Perſons.

§. 9. The clear and flame-coloured Urine proceeds from the Velocity of the Blood, which ſeparates thereby only the thinneſt of the mixt Fluid; as ſhall be ſhewn when we come to ſpeak about Secretion.

§. 10. The vaſt increaſe of Strength in Perſons labouring under high Fevers, is evident from *Lemm.* 2.

§. 11. Lastly, The Ceaſing and Diſſolution of Fevers by Purging, Sweating, Vomitting, and Abſceſſes, is wonderfully accounted for from this *Theory*. For if they go off by the Strength of Nature, then, ſeeing the greater Quantity and Velocity of the Blood produce a greater *Momentum*, by the frequent Concuſſions and Force of this, the Obſtructions are ſhattered and waſhed away till the laſt Strokes carry away all together; and thereby go off in theſe or thoſe, according as theſe or thoſe *Glands* were moſt obſtructed. This will be better underſtood, when we come to ſpeak of *Mercurial Medicines:* If by the Aſſiſtance of Medicines; then the Medicines muſt be ſuch as are moſt proper for removing theſe Obſtructions, as ſhall be afterwards ſhewn.

1. THUS, I think, I have accounted for all the Appearances of *Continual Fevers*; which I reckon one conſiderable Argument for our *Theory*.

2. ALL we ſee done in the Diſſolution or Ceaſing of ſuch *Fevers*, is the opening the *Glands*, the driving out the ſtagnated Fluids therein contained, which *per Poſtul.* 2. is another Argument. And indeed one would hardly keep himſelf from thinking, that if the removing theſe Obſtructions removed the Diſeaſe, then the putting them cauſed it: *Quo poſito ponitur, & quo ſublato tollitur.*

3. ALL that is obſervable upon opening Perſons cut off by *Fevers*, is (the reſt being ſound and entire) an extraordinary Swelling

and Lividity in the internal *Glands*; particularly of the *Lungs*, the *Liver*, the *Spleen*, and the *Meſentery*; as has been obſerved by *Borelli* and others. *Vide Borelli de Motu Animal.* Part 2. Prop. 227. This is one ocular *Demonſtration* of our *Theory*; and if the other *Glands* were as conſpicuous, I doubt not we ſhould ſee the ſame in them.

4. A fourth Argument for our *Theory* is from what Dr *Pitcairne* has demonſtrated in his *Treatiſe* of the *Cure* of *Fevers*: For ſince in *Fevers* the *Glands* are obſtructed, *i. e.* the Conduits of inſenſible Perſpiration, then by removing this Obſtruction, *i. e.* by increaſing the inſenſible Perſpiration, *Fevers* will be more probably cured, than by increaſing all the ſenſible Evacuations: And that in the Proportion the Number of the *Glands* of the whole Body has to the Number of the *Glands* of the *primæ viæ*, or as the whole outward and inward *Surfaces* have to the *Surfaces* of the *primæ viæ proxime*.

5. A fifth Argument is from what *Bellini* has demonſtrated in his third and laſt Prop. in his *Section De Febribus*. He there ſhews continued *Fevers* may ariſe from a Vitiation in the Quantity, Quality, or Motion, of the Blood; from all or either of theſe. Moreover, from an Increaſe or Di-

minution of the Quantity of the Blood, there will neceſſarily ariſe an Augmentation or Diminution of its Velocity. The Motion depends upon the Quantity multiplied into the Velocity, and the Quality ariſes (for the moſt Part) from a Combination of the neceſſary Effects of theſe. Hence you ſee, all that neceſſarily follows upon the whole there may be accounted for from the firſt of theſe, to wit, the Increaſe or Diminution of the Quantity of the Blood.

6. Amputations, Wounds, Fractures, and the like, wonderfully confirm this Doctrine. For there, a conſiderable Number of the Blood-veſſels are ſtopt, and cannot make their Circle, and conſequently increaſe the Quantity of Blood in the reſt: So that generally *Fevers* enſue, if the Quantity be not leſſened by letting. It is true, the violent Pain may concur, ſince all Pain is a *Stimulus*, and *Stimulations* occaſion a more plentiful Derivation of the *Liquidum Nervorum*. But if the Quantity of Blood be not ſuppoſed to be augmented, that Liquor muſt neceſſarily fail in a ſhort Time.

7. We may ſee viſibly in *Fevers* from Cold, there is a violent Obſtruction of the *Glands* of the *Skin*, the *Mouth*, *Larynx*, and *Stomach*: In a Word, of all theſe *Glands*

to which the cold Air is contiguous, and we can tell whence this Obſtruction proceeds; beſides this *Fever* may be increaſed to ſuch a Degree as to differ little in its Symptoms, Violence, or Duration, from other more dangerous continual *Fevers*, which is a clear Demonſtration of our Doctrine; for ſince an evident Obſtruction of the *Glands* produces *Fevers* ſo very like the moſt dangerous ones; why may we not conclude, that ſome latent and unknown Cauſe may produce ſo general and ſtrong an Obſtruction, as is able to occaſion all the ſeveral more dangerous *Fevers* of this Kind?

8. BUT that which I take to be alone (without any other Proofs) a Demonſtration of our *Theory*, is, That in all Countries betwixt the *Tropics*, their Continual or Hot *Fevers* ariſe from a ſevere cold Wind ſuddenly blowing after exceſſive Gleams of Heat. This is ſo true, that all Travellers aſſign this as the cauſe, having conſtantly obſerved their *Fevers* to ſucceed ſuch ſudden changes of the Air. A pregnant Inſtance of which we have in *Phil. Tranſ.* for *December* 1669, N. 259. In a Letter from Mr *Hugh Jones* to Dr *Woodroof*, concerning ſome Obſervables in *Mary-land*; his Words are theſe. "The North-Weſt "Wind is very ſharp in Winter, and even

" in the Heat of Summer it mightily cools " the Air; and too often at that Time, a " ſudden North-Weſtern Wind ſtrikes our " Labourers into a *Fever*, when they are " not careful to provide for it, and put on " their Garments while they are at Work." Thus he. And indeed the genuine Account of the Matter is this; the exceſſive Heat muſt neceſſarily dilate the *Glands* to which it is contiguous, *i. e.* all the *cutaneous Glands*, the *Glands* of the *Trachea*, *Bronchi*, *Oeſophagus*, *Stomach*, and of the *Inteſtines*; and it will not only dilate them, but (by the Aſſiſtance of the natural Action of theſe, which is Secretion) exhale their reſpective Liquors, making them ſtill flow, ſo long as the exceſſive Heat continues, and as there is Blood which may ſupply them: Now they being thus dilated, and (by the *Efflux* of their Liquors) ſoftened and made ſpungy, a ſudden exceſſive Cold ſupervening muſt ſtrongly contract their Orifices, and congeal their flowing Liquors, and the greatneſs of their Contraction, will be always in Proportion to the Violence of the former Heat and ſupervening Cold conjunctly; as is known from the Nature of Cold. And this Contraction of their Orifices, and Congelation of their Fluids, will obſtruct the Motion of the Blood almoſt up to the Heart, at leaſt to the next Diviſion of the *Artery* which conſtitutes this *Gland*; whereby both the Blood will be increaſed as to its Quantity, and perhaps (by this Stagnation of a Part of the ſame) as to the Quality thereof likewiſe. All which is but a *Corollary* of our *Theory*.

9. HENCE we evidently ſee the Reaſon of the frequency of our laſt Year's Fevers: For we were then exactly (in Proportion to our Climates) in the ſtate of thoſe betwixt the *Tropics*. Our Summer-Day Heats were more violent than had been obſerved among us in the Memory of Man, and our Nights had no ways the Heat proportionate to our Days: Beſides we had often ſudden Changes, which though not ſo violent as in theſe warmer Countries; yet had the ſame (though a ſlower) Effect as among them: And therefore it was, that frequent Vomittings were found ſo uſeful, which (at leaſt in ſuch a Degree as was found then neceſſary) is not always ſo ſafe. The Practice was entirely agreeable to that of theſe Southern Countries, and the neceſſity thereof will be underſtood when we come to ſpeak of *Vomitting*. The ſame Practice obtains in Fevers, occaſioned by Surfeiting or Drunkenneſs; which is ſtill to be ſuſpected as a conſiderable Part of the

Cauſe of Fevers in adult Perſons in great Cities.

10. AND generally I ſhould think either the above-mentioned ſudden changes (which may happen a Thouſand other Ways different from the Seaſon) or a direct continued Fit of violent Cold, or Exceſſes in Eating and Drinking; one or all of theſe, have a large Share in moſt of our Continual Fevers.

11. LASTLY, it is no ways accountable from any other *Theory* (as I think) how theſe Liquors which are ſecreted from the *Glands* at the Diſſolution of Fevers, could be ſo different from the ordinary Fluids which are there excerned. From ours it is evident, for an Obſtruction of the *Glands* muſt neceſſarily make their reſpective Liquors to ſtagnate, which will many ways alter their Nature; but from any other *Hypotheſis*, I do not ſee, how this can come to paſs; which will lead me to conſider one or two of the commoneſt Opinions about continual *Fevers*.

THE moſt common and generally obtaining Opinion about Fevers is, that they are more immediately produced by ſome *Morbific* Matter; (like a Poiſon) which mixing and circulating with the Maſs of the Blood, produces all thoſe frightful Symptoms which we feel. This Opinion is ſufficiently confuted, *Prop.* 222, 223, 224. *2dæ. part.* of *Borelli*'s Book *de Mot. Animal.* whether I refer the Reader; only adding (to what he has there adduced) this one Argument.

When any corrupt Matter is mixed with the Blood, ſo as to vitiate the whole Maſs, (as Vinegar among Water) the way of curing ſuch a Vitiation is either by forming new *Glands* to derive the vitious Part of the Mixture; or by draining the whole Mixture good and bad, and ſubſtituting new and pure Blood in it's Place; or laſtly, by diſpoſing the already formed *Glands* to ſecern the corrupted Part.

The firſt of theſe is ridiculous.

Something like the ſecond is done, when the Blood is really vitiated in the whole; as in inveterate Poxes, but that Cure cannot here have a Place, as ſhall be afterwards ſhewn.

As to the third Way, let us conſider,

1. How hard it is to think (when the whole Maſs is ſuppoſed corrupted) that the vitious Part, all at once, or in the Space of a few

a few Hours (in which time we know, after a *Criſis*, Fevers commonly leave People) ſhould be entirely evacuated. This is not like the Actions of Nature, which works leiſurely and by Degrees.

2. LET us conſider, whence all the *Glands* (at leaſt the greater part of them) ſhould be ſo altered, ſeeing their Configurations are ſo different, and naturally they ſecern ſo different Liquors, as all at one Time to ſeparate the ſame *Morbific* Matter. And,

3. How at the *Criſis* only, and at no other Time, they ſhould be ſo diſpoſed.

IT will be very hard in any other *Theory* (in this more particularly) ſave ours, to account for theſe Things, without recurring to Miracles, or the abſurd *Metaphoric* Terms of Sympathy, Antipathy, and the like. Theſe then, with what *Borelli* has brought againſt this Opinion in the forecited Places, are abundantly ſufficient to ſhew the Ridiculouſneſs thereof.

BUT there are ſeveral Phyſicians, who obſerving, that, in Fevers, there was (by a Vomit) a tough viſcid Matter thrown out of the Stomach, have thought this Matter generated there, and mixing with the Maſs of Blood, might be a conſiderable Part of the Cauſe of *Fevers*; at leaſt might conſiderably augment the ſame; and have from thence brought Arguments for the Neceſſity of Vomitting in Fevers.

THIS Opinion ſuppoſes theſe Things.

1. THAT the Quantity of the *Morbifick* Matter excerned by a Vomit, before the Adminiſtration thereof, was exiſtent in the Cavity of the Stomach, after the ſame Manner that other Things are, which are derived into the Maſs of the Blood, elſe it could never get thither. This I ſhall conſider when I come to ſpeak of the Operation and Effects of Vomitting.

2. THAT it is leaſt poſſible, this *Morbifick* Matter may be derived into the Maſs of Blood; let us at preſent conſider this.

I know no Way, any thing of any tolerable Conſiſtence can get into the Maſs of the Blood, but by the *Lacteal Veins*. It is true, from the ſudden Effects of ſome Spirits, Medicines, and ſtrong Meats, we are certain, that the more refined Parts of theſe may get into the *Brain*, without going the tedious Circle of the *Lacteals*: But this is done by the reciprocal Motion of the *Nerves*, the Neceſſity and Mechanical Operation of which *Borelli* has demonſtrated, *Prop.* 155, 157, 160. *2dæ. part. de Motu Animalium.* However, I think none will pretend ſuch a Courſe for this viſcous *Morbifick* Matter: And therefore if it gets into the Maſs of the Blood, it muſt go the common Road of the *Lacteals.*

To decide the Matter, I muſt ſuppoſe my Reader to have conſidered the two laſt *Prop. (Ex iis quæ ad ſeparationes)* which *Bellini* has in his *Preface* to his Book *De Urinis & Pulſibus*, &c. and the 27, 28, and 40, of his laſt Book *De Motu Cordis*, &c. where the Conſtruction of the *Glands* and the manner of Separations are demonſtratively unfolded, which I take to be the nobleſt Diſcovery (in theſe Matters) of this Age. From theſe Places it is clear, that,

Prop. 1. A *Gland* is nothing but a great many Complications and Circumvolutions of the *Artery* (all over the Coats of which little Branchings of *Nerves* paſs, deſigned principally for the ſpiral Contortion thereof); that the Blood may be the more eaſily propagated through the ſame: But this is common to all the *Arteries* and *Veins*, whereby, without any Interruption of the ſame Spire, the Propagation of the Blood, in the former, from the Heart to the Extremities of the Body, and from the Extremities to the Heart back again, in the latter, is aſſiſted) which ſends out, from the Sides thereof, little ſecretory Canals, which terminate in one common Conduit, and is called the *Emiſſary* of the *Glands*; or perhaps in a common *Pelvis* (as in the *Kidneys*); and the ſame *Artery* after theſe Windings degenerates into a *Vein*.

Prop. 2. That Separation or Secretion is performed by the Compoſition of two Motions in the Fluid; one propagated through the Length of the Canal; another tranſverſly through its Sides (for it is demonſtrable that all Fluids preſs *undiquaque* and that the Direction of their Preſſion is perpendicular in every Point to the Sides of the containing Veſſel). The Compoſition of which two is the Motion (or rather Direction) of the ſeparated Fluid.

Prop. 3. That in a mixt Fluid, conſiſting of greater and leſſer Coheſion of Parts, of greater and leſſer Fluidity: That which has the leaſt Coheſion and greateſt Fluidity is firſt ſeparated (*i. e.* is ſeparated in the *Glands*, whoſe compounding *Artery* is ſhorteſt, or at leaſt Diſtance from the Heart, or Fountain of Motion) and theſe of the next Coheſion, and next greateſt Fluidity are next ſeparated; and ſo on: The Diſtances from the Heart being in a compounded Proportion of theſe.

Prop. 4. That the *Inteſtines* are really ſuch a *Gland*, and the moſt viſible one in the Body, whoſe ſecretory Veſſels are the *Lacteals*, and whoſe common Conſervatory or *Pelvis* is the *Receptaculum Chyli*.

To theſe I ſhall add (becauſe of its Affinity) the following.

Prop. 5. The Quantity ſeparated in every *Gland*, is in a compounded Proportion of the Celerity of the Fluid at the reſpective Orifices; and of the Orifices themſelves, of the ſeparating Canals.

I ſhall here ſubjoin the Demonſtration of this Propoſition; referring (that of) the reſt to their Author.

DEMONSTRATION.

THE Orifices being given, the Quantity ſeparated is as the Celerities of the Fluid: For in a greater Celerity, there is a greater Quantity ſeparated; in a leſs Celerity, a leſſer Quantity. The Celerities being given, the Quantity ſeparated is, as the

Orifices directly, for at a great Orifice there is greater Quantity ſeparated, at a leſs Orifice a leſſer Quantity: And therefore neither being given, the Quantity ſeparated is as the Celerities, and the Orifices conjunctly, *q. e. d.*

FROM all theſe I draw the following

COROLLARIA.

1. THE ſeparated Fluids differ only in their Degrees of Coheſion and Fluidity, *per Prop.* 2.

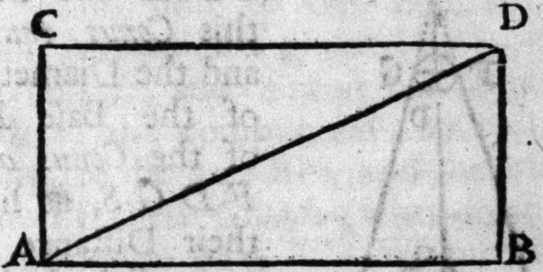
2. THE Reaſon, why Fluids of different Degrees of Coheſion and Fluidity, are ſeparated in ſuch and ſuch *Glands*, is the different Degrees of the Velocity of the Fluid at the reſpective Orifices of the ſeparating Veſſels, and the Differences of the Orifices themſelves, *per Prop.* 3.

3. THE *Glands* themſelves differ only in the Length of the *Artery*, the Difference and Number of its Complications and Convolutions, *per Prop.* 1.

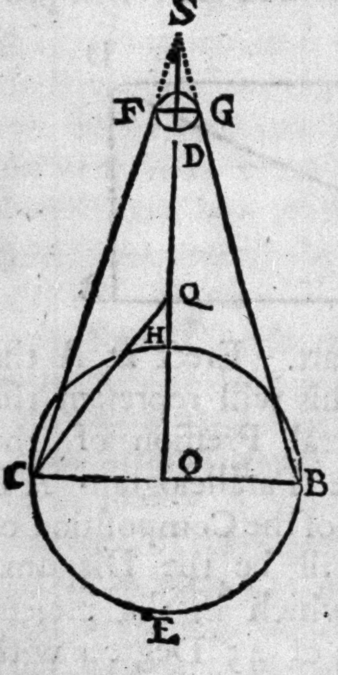
4. EACH *Gland* (naturally and equally working) ſeparates only the Fluid proper to it ſelf; *i. e.* peculiar to ſuch Lengths and Complications, of ſuch Degrees of Fluidity or Coheſion, to ſuch Bigneſs or Smallneſs of

the Orifices of the ſeparating Canal; *per Prop.* 3. and 5. But this laſt is of ſmall Conſideration.

5. That Secretion may be performed the moſt eaſily that may be, the Inſertion of the ſeparating Canal ought to be at an *Angle* of 45 Degrees with the *Artery*, *per Prop.* 2. For let A B repreſent the *Artery* (if it makes a Right-line) or its *Tangent* (if it makes a Curve) and let the Motion of the Fluid be from A to B, the Right-line A B will likewiſe repreſent its Direction propagated from the Heart. Erect at A the Perpendicular A C; this will repreſent the Direction of the lateral Preſſion of the Fluid. Compleat the Parallelogram A B C D. The Direction of the Compoſition of theſe two Motions will be the Diagonal A D, as is known; which in the preſent Caſe makes an Angle of 45 Degrees with the *Artery* A B. This were well worth the obſerving (if it be poſſible) in Animals; but



it muſt be in live ones, before their Parts have altered their Poſitions. And here it were worth the examining likewiſe, whether what Sir *Iſaac Newton* has demonſtrated (*Schol. prop.* 35. *lib.* 2. *Princip. Phil. Mathem.*) about the Reſiſtance *Conical* Figures obtain in Animal Bodies; for, though his Demonſtration be only concerning *Convex Cones*, yet the ſame obtains in *Concave* ones; wherefore ſeeing the *Artery* betwixt any two *Branchings* is a *Conus truncatus*, it may be repreſented by the Figure *C E B G F*; now ſeeing the Diameter CB of the Baſe of this *Conus truncatus*, and the Diameter *F G* of the Baſe *F D G* of the *Conus abſciſſus F D G S*, as likewiſe their Diſtance, O D, may all be had; it is evident, that the entire *Cone* C B G S H may be had likewiſe: Wherefore biſect the Diſtance O D in Q; and if it be found (having drawn C Q) that Q S is equal to Q C, then the *Conus truncatus* C E B G F (among all of the ſame Baſe and Altitude)



gives the leaſt Reſiſtance to the Blood flowing from O to D. I am inclined to think this may obtain in the Trunks of the great *Arteries*, betwixt their branchings (for no further is to be conſidered). This I recommend to be examined for the Honour of that great Man, who has crouded up in this *Scholium* (not to mention the reſt of his admirable Book) a vaſt number (if retailed) of moſt charming and uſeful Truths.

To come now to the Buſineſs: The *Teſticuli Humani* are granted by every one to be *Glands*; and *Bellini* has found the Length of the complicated *Artery* in one of them, to be 300 Ells, and the Altitude of one of theſe *Glands* (when freed of its Integuments) to be $\frac{1}{16}$ Ell: Whence I conclude, there muſt be 4800 Plications or Circumvolutions in one of theſe, *proximè*. He likewiſe aſſerts, That *(cæteris paribus)* if two Fluids of the ſame Nature, with equal Velocities, the one be forced into a Canal of the ſame Number and Lengths of Complications, as are in the foreſaid *Gland*, and the other into a ſtrait Canal of the ſame Length; the Velocity (in or about their *Exits)* of the firſt Fluid, to that of the ſecond, will be as 1 to 4800. He has not indeed ſubjoined the Demonſtration, but if we ſuppoſe the *Artery* to lie in *Plicæ*, or Folds, of ſuch Number and Lengths, as we have juſt now determined; (which is perhaps not far from Truth) and we ſuppoſe the Turnings of the *Plicæ* to be circular; (which perhaps may follow from this, That ſeeing a Circle is the only ordinate Figure of an infinite Number of equal Sides, and equal Angles; it muſt be the only *Curve* which can make (in all its Parts) the Angles of *Incidence* equal to the Angle of *Reflection*, and conſequently the only *Curve* in which a Fluid would moſt eaſily turn) and likewiſe the Arch in which they turn to be a Semi-circle; (which it muſt be, if the Sides run parallel after the turning; and univerſally, if the Sides produced make any Angle from the Quantity thereof, the Quantity of the Arch in which they turn may be determined) I ſay, from theſe *Data*, the former Proportion may be by Calculation examined; or perhaps, more briefly by Experiment, thus,

TAKE a Pipe of Metal of any Diameter, and fold it into any determined Number of *Plicæ*, whoſe Sides may run parallel, and whoſe Lengths may be $\frac{1}{16}$ Ell: Then, by a Weight, force a Liquor through it, and obſerve the Time betwixt the firſt Entry of the Liquor into the complicated Canal, and its firſt Appearance at the other Orifice; then take another ſtrait one of the ſame Length with the former, and with the ſame Weight force the Fluid through it, obſerving the ſame Way, the Time of its Paſſage, the Lengths being the ſame, the Velocities ſhall be as the Time of paſſing reciprocally, as is known. Having thus got the Proportion of their Velocities in any one determined Number of *Plicæ*, we may (by the *Rule of Three)* have their Proportions, in any aſſigned Number thereof. Suppoſing then that this great Man has found the Truth of the aforeſaid Proportion from ſome ſuch Way, as one of theſe; it follows, that in every turning, the Velocity muſt be abated $\frac{1}{4800}$ of the whole, *proximè:* (for 4800 : $\frac{4800}{4800}$: : 4800 : 1.) Now let us ſuppoſe the Proportion of the Coheſion, and Fluidity of the Fluid ſeparated in the *Teſticuli Humani*, to the Coheſion and Fluidity in our *Morbific* Matter, now derived from the Stomach into the ſmall *Inteſtines*, to be as 1 to 3. (I mean the Coheſion and Fluidity of the Fluid ſeparated in the *Teſticuli Humani*, as it is when immediately ſeparated. For when it has lodged any Time in the *Veſiculæ ſpermaticæ*, we know by its Ebullitions and the Evaporation of its thinner Parts, it loſes a great deal of its Fluidity.) And that this is a liberal Allowance is evident from *Leu-*

wenhoek's Experiments ſcattered up and down the *Phil. Tranſ.* and printed all together at *Amſterdam*; where we may ſee from the *Microſcopical* Obſervations he has made on this Fluid, its Fluidity is little leſs than that of common Water: And conſequently, at leaſt, ten Times more than that of our *Morbifick* Matter.

And here I hope it will not be impertinent, to ſet down a Propoſition to compare the Viſcidities of different Liquors.

PROPOSITION.

LET two Drops of two different Liquors fall into a Pair of fine Scales; (a Drop of the one Liquor into one Scale, and a Drop of the other Liquor into the other Scale) ſo that there fall no more than juſt their own Gravities carry down: Thus you ſhall have, what I here call, their comparative Gravities: and by the ordinary Method you may likewiſe have their Specifick Gravities. Theſe being given; I ſay, their Viſcidity and Coheſion ſhall be in a compounded Proportion of their Specifick Gravities reciprocally, and their comparative Gravities directly. The Demonſtration is eaſy from the Nature of Fluids.

LET us again ſuppoſe the Length of the ſmall Guts, (for it is there only where any Thing is ſeparated from the *Inteſtines*) to be 6 Yards; and that in every $\frac{1}{16}$ of a Yard, there is a Plication: (And that theſe are likewiſe liberal Allowances; any who have ever ſeen a Diſſection will know) Then there will be 96 Plications in the whole; and conſequently the Fluid in theſe *Inteſtines* will loſe but 96 Parts of the whole Celerity it had at its Entry.

Laſtly, Let us ſuppoſe that Celerity to be equal to the Celerity of the Blood, when it firſt enters the Plications of the *Teſticulus Humanus* (which all will readily grant, who conſider, that there is never any Thing found in theſe ſmall Guts, but a thin Liquor in a wide Canal, thruſt forward by the Force of the *Fibres* of the Stomach and *Inteſtines)*. Let us call this Celerity *a*.

Now from *Corol.* 1, 2, and 3, about Separation; if a Viſcidity, as 1 gives 4800 Plications, then a Viſcidity as 2 will give 9600 ſuch: And therefore, that ſuch a viſcid Liquor ſhould be ſeparated, it is requiſite it ſhould loſe 9600 Parts of the whole Celerity: But (as has been juſt now ſhown) by the *Plicæ* of the *Inteſtines*, the

Fluid will loſe but 96 Parts of the Celerity *a.* Whence it is abſolutely impoſſible that the *Inteſtines* ſhould ſeparate this viſcid Matter, unleſs they were a hundred Times longer than they are: For 96: 9600 :: 1: 100. If the Viſcidity of the Fluid, ſeparated in the *Teſticulus Humanus*, were to that of our *Morbific* as 1 to 10, then the ſmall *Inteſtines* ought to be five hundred Times longer than they are. And indeed I believe the Proportion really not to be under 1 to 50; and then they ought to be at leaſt 25 hundred Times longer than they are.

THUS we ſee the ſecond Thing (this Opinion ſuppoſes) is falſe? and indeed, it hardly could be otherwiſe; for (in my Opinion) the *Fæces* themſelves might more probably get into the Maſs of the Blood, than this viſcid Matter, the Parts of thoſe being only united by a ſimple Contact; whereas the Parts of this are joined by a very ſtrong *Niſus.* And I remember, Dr *Liſter*, ſomewhere in the *Phil. Tranſ.* relates how he tryed to get in a very fine tinged Spirit into the *Lacteals* of a live *Dog*, by cutting the ſmall Guts, and injecting the Liquor, then ſewing up all again: But he could never get it done to his Satisfaction. And it is to be obſerved, that People may be deceived with blue Tinctures; for this is the Natural Colour of theſe *Lacteals* when they are almoſt or altogether empty.

IF it be objected, 1. That the Concoction of the Stomach and *Inteſtines* may fit this *Morbific* Matter, to be ſeparated by the *Lacteals*. 2. That the *Periſtaltic* Motion and the *Valves* of the *Inteſtines* may hinder the quick Motion of the compounded *Chylous* Matter. 3. That there are ſome Medicaments, as *Turpentine*, &c. which we know, by their Effects, get into the Maſs of the Blood, and yet are more viſcid than our *Morbific* Matter. 4. That there is really as viſcid Matter ſeparated in ſome other *Glands*, as the *Bile* and the *Phlegm*.

To theſe I anſwer,

1. As to the firſt; ſeeing *Triture* is the only Effect of the Stomach and *Inteſtines*, there is no Advantage to be reaped thence; for no beating nor grating will diſſolve the Union of this *Morbific* Matter. Beſides, where it is in any Plenty, the Effects of Concoction are very ſmall, or none.

2. As to the ſecond; The *Periſtaltic* Motion being reciprocal, it adds as much (to the Motion of the *Chylous* Matter) in its

Deſcent towards the *Rectum*, as it takes away, in its Aſcent towards the Stomach; and ſo cannot ſerve that End, the *Plicæ* and Circumvolutions of theſe *Inteſtines* (which we have conſidered) being only to be relied on for this Purpoſe. As to the *Valves*, we know they all open toward the *Rectum*, and ſerve only to ſtop the Aſcent of the *Fæces* in the Periſtaltick Motion, and ſo cannot retard the Motion of the *Chylous* Matter.

3. As to the third; we likewiſe know, that all theſe Medicaments are diſſolved into a thin Liquor by Heat. (as *Turpentine*, Butter, *&c.*) Beſides that only the moſt ſpiritous and leaſt viſcid Parts enter the Blood; which is not ſaid of our *Morbific* Matter.

4. As to the laſt; there is a great Difference betwixt a Liquor immediately after it is ſeparated, and when it has ſtagnated ſome time in the Conſervatory of the *Gland*; for then the aqueous and more humid Parts evaporate; and by its Stagnation it acquires an Ineptitude to Motion: And though the Blood flows very eaſily in the *Arteries* and *Veins*; yet I defy any to cauſe extravaſated Blood to enter its Veſſels again. But more particularly, we muſt conſider the *Liver* to be a very large Veſſel, and (if it were evolved)

ved) to make an *Artery* many thouſand Times longer than that of the Canal of the ſmall *Inteſtines*, or *Teſticulus Humanus* either; and ſo it is no wonder if it ſeparates a viſcid Matter; the Motion of the Blood there being very ſmall: But ſtill I aſſert it is not near ſo viſcid as our *Morbific* Matter is. As to the *Phlegm*, we know it is not naturally produced; and the *Morbific* Matter it ſelf (againſt which we diſpute) might be as well objected; for it is only the Stagnation, Corruption, and Evacuation of the Humidity which occaſions both; the ſame might be ſaid of the purulent Matter which paſſes by *Urine*, but that we know it proceeds from an *Ulcer* in the *Kidney*, or Neck of the *Bladder*, and is not diſcerned with the *Urine*.

Having dwelt thus long on the Opinions of others, I come now to conſider the proper Remedies of Fevers, which I reduce to, 1. *Blood-letting*. 2. *Vomitting*. 3. *Purging*. And, 4. The *Medicaments* which increaſe the leſs *ſenſible Evacuations*; under which Head I comprehend Sweating, Perſpiration, and the like.

I do not here conſider Bliſtering and outward Applications; ſeeing (in my Opinion) they are only uſeful to remove the accidental

Effects, and not the Cauſe of Fevers, without which they cannot be ſaid to be truly cured.

1. As for *Blood-letting*; The Subject is is ſo fully and learnedly treated by *Bellini* in his forementioned Books together; that it were equally impoſſible as impudent to offer at any Additions: And therefore for entire Satisfaction on this Head, I ſhall refer my Reader to theſe Books.

2. As to *Vomitting*; I ſhall comprehend all I have deſigned to ſay about it in theſe Particulars. 1. I ſhall ſhow that Vomiting is partly produced by the *Vis ſtimulans Vomitorii*: But, 2. That is moſtly occaſioned by the *Vis ſtimulans* of the *Morbific* Matter excerned from the *Glands* of the Stomach. 3. I ſhall prove that this *Morbific* Matter is not in the Cavity of the Stomach (at leaſt in ſuch Plenty as it is excerned by a forced Vomit) before the Ingeſtion of the ſaid Vomit. 4. I ſhall give the whole Deſtruction and Connexion of this Operation; And, 5. Shall conſider the Advantages of the ſame in the Cure of Fevers.

Before I come to handle theſe, it is neceſſary, I firſt explain what I here mean by a *Vis ſtimulans*.

BY a *Vis ſtimulans*, I underſtand ſuch Quality in a Fluid, whereby the Particles thereof are diſpoſed to make a real Diviſion or a violent Inflexion of the *Nervous* and *Membranous Fibres* of the Body, which occaſions frequent and forcible Reciprocations, Succeſſions, and Derivations of the *Liquidum Nervorum* into the *Muſcles* and contractile *Fibres* of the Canals; whereby all the involuntary *Muſcles* are brought into violent Contractions, and the Emiſſaries of the *Glands* are ſqueezed.

THOSE who deſire a fuller Account of the Nature and Mechanical Operations of this *Vis ſtimulans*, may ſee it, *Pag.* 165, &c. of *Bellini*'s Book *De Urinis & Pulſ.* & *Prop.* 52. of his laſt Book *De Motu Cordis.* I ſay then,

1. *Vomitting* is *partly* produced by this *Vis ſtimulans Vomitorii*; This is evident from theſe Conſiderations. 1. Becauſe ſometimes we immediately vomit upon the Ingeſtion of the Vomitory, before the *Morbific* Matter excerned from the *Glands* of the Stomach could have time to concur. 2. We throw up very often the ſame we had taken in, with little or no Mixture; which could not happen, if the *Morbific* Matter

had concurred to produce the Fit. 3. Sound Perſons (in whoſe Stomachs there is little or none of this *Morbific* Matter) often vomit upon a too plentiful Ingeſtion of an (otherwiſe) inoffenſive Liquor. The only Reaſon of which muſt be, that that the Stomach not being able to derive into the Maſs of the Blood the ſaid Liquor, ſo faſt as it is poured in, it muſt ſour on the Stomach, and thereby acquire this *Vis ſtimulans*, whereby it is thrown out: Or perhaps it may ſtill have a *Vis ſtimulans*, though not (when it is in a ſmall Quantity) ſufficient to bring the Stomach into that violent Contraction which is neceſſary in Vomitting; But this ſmall *Vis ſtimulans* being multiplied by the too great Quantity of the Liquor, may acquire ſufficient Force to produce the Effect; as we ſee ſeveral things loſe the Quality to produce their viſible Effects, when in ſmall, which they had when in great. But, ſecondly,

I ſay, Vomitting is moſtly occaſioned by this *Vis ſtimulans* of the *Morbific* Matter excerned from the *Glands* of the Stomach; and that for theſe Reaſons, 1. The Action of the *Vis ſtimulans Vomitorii* being terminated at, or near, the internal Surface of the Stomach, after one or two plentiful Fits of Vomitting, (there being produced thereby ſuch a Succuſſion and Compreſſion of the Sides of the Stomach) theſe *Particulæ Stimulantes* muſt neceſſarily be diſentangled; and ſo there could be no more Fits of Vomitting, which is contrary to Experience. 2. We evidently ſee in Sea-vomits, and in thoſe produced by the Joltings of a Coach in ſome People, there is no *Vis ſtimulans Vomitorii* to which we can attribute this Effect; and therefore it muſt neceſſarily be produced by the vellications of the Morbific Matter excerned by this particular Motion. The Manner of which may be thus explained, every particular Body has a determined Degree of Tenſion, and a determined Length. And if a like Reciprocation of Motion (by whatſoever Cauſe) be produced in the ambient *Medium*, which would neceſſarily be produced by another Body (when moved) of the ſame Degree of Tenſion, and of Length commenſurable to the Length of the firſt Body, there muſt be of neceſſity a Motion produced in that firſt Body, eſpecially if the Motion of the *Medium* be violent, and the commenſurable Lengths be as the firſt Numbers of the ordinary Arithmetical Progreſſion, 1 to 2, or 1 to 3, or 2 to 3, *&c.* This is evident in the uniſon or concordant Strings of greater Muſical Inſtruments: And the Reaſon is, because thereby the *Oſcillations* of ſuch Bodies become commenſurable. Now I ſuppoſe this particular Motion of jolting Coaches and Ships, to be ſuch, as would be produced by another Body, having the juſt now mentioned Analogy to the *Nerves* of the *Glands* of the Stomach, whereby they are brought into Motion, and conſequently derive great Plenty of their *Liquidum* into the Places, which makes ſuch Contractions as ſqueeze theſe *Glands* of the Matter, which produces theſe Fits of Vomitting: Beſides, that the ſame cauſe may (upon other *Fibres*) produce the antecedent Sickneſs which we feel in Sea-Vomits. 3. By a Vomit of warm Water (for example) there are often produced ſeveral Fits of Vomitting; and yet we all know there is no *Vis ſtimulans* in it: So that all it can do, is, that by its Warmth (which is a kind of a *Fotus*) it elicits the Matter from the *Glands* of the Stomach, which occaſions this vomitting. I could add a great deal more to confirm this Propoſition, but I think this ſufficient. I ſay,

3*dly*, THAT the *Morbific* Matter (excerned by Vomitting) is not exiſtent in the Cavity of the Stomach, (at leaſt in ſuch Plenty, as it is excerned by a forced Vomit) before the Adminiſtration thereof. 1. This is an evident Corollary from the former *Prop.*

The Vomit does not act (at leaſt after the firſt one or two Fits) by it's own *Vis ſtimulans*; there is (in Vomitting) produced a violent Contraction of the *Fibres* of the Stomach, the *Muſcles* of the *Abdomen* and *Diaphragm*, which muſt be occaſioned ſome Way. There is nothing (in Vomitting) which can occaſion this, but either the *Vis ſtimulans Vomitorii*, or of the excerned *Morbific* Matter; and ſince (as has been already proved) it cannot be the former, it muſt of neceſſity be the latter: Wherefore if the *Morbific* Matter were already exiſtent in the Cavity of the Stomach, the Vomit were of little uſe after one or two Fits; which is contrary to Experience. 2. If this *Morbific* Matter were already in the Cavity of the Stomach, it is not poſſible, but that one or two plentiful Fits of Vomitting, would eject all that is there; ſo that afterward there ſhould none be thrown out, however violent the conſequent Fits were, which is likewiſe contrary to Experience. The Force of the *Muſcular Fibres* of the Stomach, the *Muſcles* of the *Abdomen* and *Diaphragm* (which two laſt Monſieur *Chirac*, Profeſſor of Medicine at *Montpellier*, by an eaſy Experiment, has ſhewn to concur principally in vomitting. *vide, The Preface of Tournefort's Hiſtory of Plants growing round Paris)* is at leaſt equal to

260000 *lib.* Weight; (the Force, of the *Muſcles* of the *Abdomen* and *Diaphragm* being more than that of 248000 *lib.* and of the Stomach, not inferior to that of 12000 Pounds) which Force if it be not ſufficient to drive out all that is exiſtent in the Cavity of the Stomach (however viſcid the Matter be) I leave every one to judge. 3. Suppoſing the *Morbific* Matter already in the Cavity of the Stomach; it is impoſſible to give an Account of the different effects of different Vomits: For Example, why an *Antimonial* Vomit does excern this *Morbific* Matter more plentifully than Whey or warm Water. For if before the Ingeſtion of either, the *Morbific* Matter is already in the Stomach, then the only thing left for them to do, is, to excite the Act of Vomitting: But it is certain they may be both brought to be equal in that, *i. e.* they may be both brought to excite an equal Number of Fits of Vomitting; and that with equal violence (by taking their Quantities in a reciprocal Proportion to their Vomitive Faculties). And yet their Effects be very different, otherwiſe I omit (for avoiding Tedious neſs) the other Arguments I can produce to confirm this Propoſition.

4thly, THE whole Deduction and Connexion of this Operation is thus: The Particles of the Vomitory by their *Incuniation* into the Orifices of the *Emiſſaries* of the *Glands*, adjacent to the Surface of the Stomach, do dilate the ſame (which by ſome extrinſic Cauſe) had been contracted, and after the ſame Manner do diſſolve (at leaſt in ſome Degree) the Coheſion of the ſtagnant *Morbific* Matter, and render it more fluid; and conſequently, its Reſiſtance leſs: Now, the natural and conſtant Action of the *Glands* being Secretion; and the *Impedimentum* (by the Dilatation of the Orifice and Attenuation of the Fluid) being totally taken away, or (at leaſt) made leſs than the natural *Momentum* of the *Glands*; the Matter muſt neceſſarily flow into the Cavity of the Stomach, till it be accumulated in ſuch a Quantity (which not being to be done in an Inſtant, muſt require ſome Time) as is ſufficient (by the united loathſomeneſs and the *Vis ſtimulans* of it, and the Vomitory) to vellicate and force the *Fibres* of the Stomach, *Abdomen*, and *Diaphragm*, by the Communication of the *Nerves* of the firſt with the two laſt) into a violent Contraction, and thereby throw all out by the *Oeſophagus*, which brings all to quiet again, till there be a new, a ſufficient Quantity excerned from theſe *Glands* to reproduce the aforeſaid Contraction: And thus there happens a Fit of Vomitting and Quiet alternately, till either all the *Morbific* Matter be thrown out, or the Force of the Vomit ſo diluted, that it is no longer able to elicit the *Morbific* Matter from the *Glands*. Beſides theſe primary Effects of Vomitting, there are two others, which ought not (though leſs principal) to be omitted. The firſt is, that in a ſtrong Vomit, or in one which requires ſome conſiderable Time before it operates, there often paſſes ſome part thereof from the Stomach into the *Inteſtines*, and occaſions a gentle Purge, by diſſolving the *Fæces*, and vellicating the *Fibres* of the *Inteſtines*, as ſhall be more particularly ſhown when we ſpeak of *Purging*. However, the Effects of this purge very ſeldom, or never go beyond the *Primæ Viæ* ; for all gentle Purges (of which this is one) are confined within theſe. The ſecond is, that the ſtrong Contraction in ſo many *Muſcles* and *Muſcular* Canals, which are at Work in vomitting, and the violent Concuſſion which is produced over the whole Body, by a Power (as has been ſaid) which is not inferior to that of two Hundred and Sixty Thouſand Weight, may and often does, take away the Obſtructions in many other Canals, than thoſe which are more immediately concerned about the Stomach and *Oeſophagus*, as we evidently ſee by that vaſt Sweat which always breaks out after plentiful Fits of Vomitting. From theſe I deduce,

5thly, The Advantages of Vomitting in the *Cure* of Fevers; which are, 1. The taking away the Obſtructions of the *Glands* of the Stomach, and (ſometimes) of the *Inteſtines*, which is the principal uſe of vomitting; and how great a Step this is toward the Cure of Fevers, every one will ſee who conſiders, that in Fevers occaſioned by Intemperance, the Stomach is the Scene where this great Miſchief is both contrived, and put into Execution; the Obſtruction of the *Glands* thereof, being the firſt and principal Cauſe of theſe Fevers; and in Fevers occaſioned by Cold, the Stomach and *Inteſtines* being moſt expoſed, and leaſt defended from the cold Air, receives its firſt and ſtrongeſt Impreſſions; which two (as formerly was ſaid) have the moſt conſiderable Share in the Cauſe of our continual Fevers; And therefore it is, that vomitting (being timely and plentifully uſed) very often prevents ſuch Fevers. 2. Another Advantage of Vomitting is, that by the ſtrong Contraction of the *Muſcles* and *Muſcular* Canals and the violent Concuſſions of the whole Body thereby produced, the Obſtructions of many other *Glands* are removed, (as has been juſt now ſhown) ſo that this with the former

(removing

(removing ſo conſiderable a part of the Cauſe) enables Nature to perform the reſt very eaſily. 3. A third Convenience (if not Advantage) of Vomitting is, That it is leſs dangerous than many of the Medicaments that are taken inwardly; The Effects of this is confined to the *Primæ viæ*, (by which I always mean that winding Canal, which is continued from the Mouth to the *Sphincter Ani)* and is conſequently leſs dangerous than thoſe which run the Circle of the Blood; for it is not to be doubted, that all alterative Medicines have more or leſs Danger in them (from the Effect of their Stimulations upon the *Nerves*, their Fermentations with the Blood, their ſeparating, or promoting the natural Coheſions of the Liquors of the Body, and their many other unknown Productions). That which goes out the leaſt way, muſt therefore have the leaſt Danger: Now, ſince it is certain, that Vomitting does not go out of the Stomach and *Inteſtines* (where the Canals are ſtrong and wide, and the Fluids are viſcid and groſs) there muſt of Neceſſity be leſs Danger in it, than in theſe which enter into narrower and weaker Canals filled with more fluid and finer Liquors. It is true indeed, there is ſome Hazzard from the burſting of the Capillary Veſſels of the internal Surfaces, by the violent Concuſſion of the Body, occaſioned by Vomitting;

ting; but this is eaſily prevented by Bloodletting which ought always to precede the plentiful uſe of Vomitories in all Diſeaſes. Beſides, ſometimes the Violence of the Vomit, is too great for the Strength of the Patient; but this is rather the Fault of the Phyſician than the Phyſick: For the Strength, and (conſequently the Violence of Vomits, as of all other Medicines) ought to be adjuſted by this Proportion, *viz.* They ought to be in a compounded Proportion of the Strength of the Patient, and the Danger of the Diſeaſe. If this were obſerved, none could ever err in the Adminiſtration of Medicines.

III. COME we now to that which we called the third proper Remedy of Fevers, to wit, *Purging*; in explaining of which, I ſhall, 1. Shew that vomitive and purgative Medicines differ only in Degrees of the ſame Quality. 2. I ſhall give a ſhort Account of the ſeveral Steps, and of the Manner of this Operation. And, 3. Conſider its uſe in the Cure of Fevers. I ſay then,

1. THAT vomitive and purgative Medicines, differ only in the Degrees of the ſame Quality, *i. e.* Purgative Medicines, by increaſing their Force vaſtly, and confining it to a leſſer Quantity, either of a fluid or ſo-

lid Body, become Vomitive, and vomitive Medicines (if diluted) become Purgative. This will be evident from theſe Conſiderations.

1. We find by Experience, a ſtrong Purge never miſſes (if either it be very ſtrong, or the Patient not very ſtrong) to vomit, and the weaker part of a Vomit, which eſcapes into the *Inteſtines*, does frequently purge us. 2. The ſame Medicines (for Example, *Vinum Emeticum)* taken by the Mouth, will provoke Vomitting, which given by way of *Gliſter*, will purge: The ſame obtains in all ſtrong Emetics. In ſhort, all ſtrong Medicines of either kind conſtantly produce both theſe Effects. The Reaſon of all which is this; if the Medicament of either kind be ſo ſtrong as immediately to vellicate and ſtimulate the *Fibres* of the Stomach, to dilate the Orifice, and attenuate the Matter contained in the *Glands* thereof, it produces Vomitting; if it act but gently, ſo as only to aſſiſt the natural Motion of Digeſtion, it goes by the *Inteſtines*, and diſſolves the Coheſion of the *Fæces*, and finding there more ſenſible *Fibres*, is able to bring them into violent Motions, which produce purging, as ſhall be juſt now ſhown. 3. It is impoſſible in any other *Theory*, to account how theſe two different Medicines, ſhould

upon the ſame Parts produce different Effects: For both theſe Medicines are taken by the Mouth, go down the *Oeſophagus*, and enter into the Stomach, either in the Form of a *Liquid*, or are there by it reduced into a *Liquid*; and conſequently are brought into contact with, and operate on, the ſame *Fibres*, *Glands*, and *Membranes*; and yet produce (by their Aſſiſtance) two different Effects. It is ſimply impoſſible to explain the Manner of this, without ſaying the one acts more powerfully and forcibly, and makes more violent Contractions, and conſequently is thrown up the moſt patent way; the other more gently and ſoftly, and has thereby time to ſeek out the leſs obvious Paſſages.

2dly, The Account of the ſeveral Steps, and of the Manner of this Operation, is thus; Purgative Medicines, being received into the Mouth, and admitted into the Stomach, their Particles vellicate and ſtimulate the *Fibres* thereof, and thereby increaſe the digeſtive Faculties, *i. e.* bring the *Muſcular Fibres* of the Stomach, the *Muſcles* of the *Abdomen* and *Diaphragm* into more frequent Contractions than ordinary, till they are admitted into the *Inteſtines*, the *Fibres* and *Glands* of which being more ſenſible than thoſe of the

Stomach (whoſe Parts by the frequent rough Contacts, of one againſt another, and of the groſs Bodies which are often thrown into it, are as it were deadened) they eaſily move and bring into frequent and forcible Contractions, whereby theſe *Glands* are ſqueezed of a Fluid, which lubricates the Paſſages; and mixing with the feculent Matter of the *Inteſtines*, which is rendered Fluid by the ſame active and ſtimulating Quality of the purgative Medicine) renders it yet more fluid, by which (and by the more than ordinary Contractions of the *Inteſtines)* it paſſes more plentifully and eaſily into the *Rectum*, and is thence ejected. This is the uſe of the more gentle Purges which only cleanſe the *Inteſtines.* But thoſe of more Force (beſides all theſe) do (as to the greater and more ſpirituous part) enter into the Maſs of the Blood by the *Lacteals*, and mixing therewith produce many unnatural Fermentations therein, ſeparating or promoting the natural Coheſions of the Liquors of the Body, and occaſioning many other unknown Effects, as has been formerly ſaid: And likewiſe there, vellicating the ſpiral *Fibres* of the *Arteries* and *Veins*, bring theſe into more forcible Contractions, and thereby promote the Circulation of the Blood, and make it run with greater Velocity and Force; and by this Means in a ſhort Time waſh away any Obſtructions that either happen to be in the more direct *Arteries*, or the more complicated ones which conſtitute the *Glands*, increaſe the inſenſible Perſpiration, and purify the Blood of all the groſſer and more noxious Parts, by the *Ductus Chylodochus* and *Pancreaticus*, which void themſelves into the *Inteſtines*. All theſe Effects of the more powerful Purgatives are viſible; for ſometimes after one has taken ſuch a ſtrong Purge, we find the Pulſe mightily increaſed, the Perſpiration augmented, the Spirits, or *Liquidum Nervorum*, ſpent, the viſible Excretions by Siege and Urine much greater, and the Body weakened; eſpecially after a few Days of ſuch a Courſe. Whereby it is evident, theſe Medicines muſt operate after the Manner now explained. From hence it is clear,

3*dly*, THAT the Advantages of purging in the Cure of Fevers are very great, upon theſe two Conſiderations. 1. If the Purge be more gentle, ſo that it only ſerves to cleanſe the *Inteſtines*, it partly takes away the Obſtruction of the *Glands* of the Stomach, and totally that of the *Glands* of the *Inteſtines*; which is a conſiderable Step towards the Cure. But, 2. If the

Purge be more violent, ſo that it enter in any Plenty into the Maſs of the Blood, it conduces ſo much toward the Removal of the Obſtructions of moſt of the other *Glands*, that Nature is able to perform the reſt very eaſily her ſelf. But alas! This Caſe has ſo much Danger, and ſo many Inconveniences in it, as render it as unſafe as otherwiſe (if theſe could be removed) it would be uſeful. *Bellini*, in his Book *De Urinis & Pulſibus*, *pag*. 222. has demonſtrated, that in violent Purges there is a greater Danger by far than in Blood-letting. His Words are, “ *Quia vero quicquid eſt ſuſpicionis in miſſione Sanguinis ad ſolum fermentationem non naturalem, qui poſſibilis per ipſam eſt in reliquo Sanguine redigitur, & hoc uno de nomine periculo non vacat; ſi igitur hujus mali ſuſpicione careret purgatio, illa potius adhibenda, quam venæ-ſectio; cum purgatio ejus loco cæteroquin eſſe poſſit: ſed res è converſo ſe habet, ſuſpicio enim ejus mali à miſſione Sanguinis eſt ſuſpicio rei poſſibilis non tamen neceſſario provenientis, aut neceſſario conjunctæ, cum qualibet miſſione Sanguinis; in purgatione autem neceſſarium ſemper eſt Sanguinem ſolvi à naturalibus Cohæſionibus, ſeu recedere & dimoveri à ſua compoſitione; In Purgatione igitur periculum erit certum, in*

" *venæ-ſectione dubium: hoc eſt, erit Pur-*
" *gatio venæ-ſectione periculoſior*, &c." And there he goes on to ſhew how much more dangerous Purging is than Blood-letting. From this, and a great deal more, he has there adduced, it is evident, 1. That violent Purges have a great deal of real Danger in them abſolutely, without reſpect to other Remedies; and theſe unnatural Fermentations and Changes of the Coheſion of the Fluids, inſtead of promoting the Cure, often increaſes the Cauſe of Fevers, to wit, the Obſtruction of the *Arteries* which conſtitute the *Glands*. 2. That violent Purges are reſpectively much more dangerous than Blood-letting; wherefore this laſt is a more ſafe, and conſequently a more uſeful Expedient in the Cure of Fevers, than the former. And I ſay, 3. That violent Purges are a much more dangerous Remedy in Fevers, than Vomittings are; for Vomits extend no farther than the *Primæ Viæ*, where Canals are ſtrong and wide, the Fluid viſcid and groſs; but violent Purges reach all the ſlender Veſſels and noble Liquors of the Body, where the Danger of any conſiderable Alteration is extreamly great. Wherefore upon this Account, I ſay, that the Danger of violent Purges is to that of Vomitting, as the Length of the Canals of the whole Circuit of the Blood,

is to the Length of the Canals of the *Primæ Viæ*. And how much longer the firſt is than the latter, I leave the Reader to conſider. Beſides all theſe, there are ſo many other known and evident Dangers in violent Purges, that the only Part of Purging, which is ſafe (in curing Fevers) is *Gliſtering*, or the *Lotiones Alvi*, or rather than either of theſe, only that gentle Purge, which is the concomitant of every plentiful *Vomitting*.

IV. We are come now to the laſt proper Remedy of Fevers, which was the *Medicaments which increaſe the leſs ſenſible Evacuations*. But all that can be pertinently ſaid on this Head; is ſo learnedly and accurately already handled in a Treatiſe intituled, *Archibaldi Pitcarnii Diſſertatio de Curatione Febrium, quæ per Evacuationes, inſtituitur*, that thither I ſhall refer the Reader, only adding the Reaſon why ſuch Medicaments adminiſtred in the Beginning of Fevers, do rather increaſe than cure them, which is this: In an Obſtruction of the *Glands*, the Blood in the complicated *Arteries* which conſtitutes the ſame, ſtagnates up to the next Branching thereof, neareſt the Heart; and thereby a conſiderable Length thereof becomes obſtructed and unpaſſable; the only way this Obſtruction can be removed is by the Force of the Blood, which in every Pulſe or Contraction of the Heart, waſhes off a Particle of the ſame till the whole be digged away; as ſhall be ſhown. Now the *Arteries* which conſtitute the *Glands*, whereby the inſenſible Evacuations are naturally ſecerned, being in the beginning of the Fever ſo much obſtructed; it is ſimply impoſſible for ſuch Medicaments to carry theſe Obſtructions off as they are juſt now; they muſt rather force through the ſuperficial *Arteries*, and thoſe few other *Glands*, that are (perhaps) left paſſable, the natural Humidity only, *i. e.* the thinneſt Parts of the Blood, and conſequently make it more viſcid, and thereby the Obſtruction more firm, *i. e.* will increaſe the Fever; whereas, when a great deal of theſe Obſtructions in the *Arteries* are waſhed away by the Force of the Blood; *i. e.* in or near the Decline of theſe Fevers, ſuch Medicaments will be able to force the ſmall Remainder of theſe Obſtructions, either through the Orifice of the *Gland*, or into the continued *Vein*, 'till, by frequent Circulations, it be either loſt, or thrown out of the Body.

From all that has hitherto been ſaid about the Cure of theſe Fevers, it is evident,

COROLLARIA.

1. THAT the firſt Thing incumbent upon a Phyſician, in the Caſe of theſe Fevers, is to let a conſiderable Quantity of Blood, both in order to remove the Cauſe of theſe Fevers, and to prevent the Inconveniences of the ſubſequent Vomitting. *Bellini*, in *Prop.* 5. and 6. *De Febribus*, has demonſtrated, that "*Vena in omni morbo* "*eſt ſecanda, in qua minuenda quantitas, aut* "*augenda velocitas, aut refrigerandum aut* "*humectandum, aut aliquid adhærens vaſis* "*dimovendum aut abripiendum.*" Than which there could be nothing more pat to our Theory.

2. THE ſecond ſtep in the Cure of theſe Fevers is Vomitting; for it at leaſt removes the Obſtructions of the Stomach and *Inteſtines*, and goes a great Length to take away the Obſtructions of the other *Glands* likewiſe. This eſpecially obtains in Fevers occaſioned by Intemperance or Cold: As is evident from what we have ſaid about Vomitting; but as for Purging in Fevers, there is very little more ſafe than what is the neceſſary Concomitant of all ſuch Vomittings.

3. THE laſt, but moſt univerſal, and ſureſt Step, is the increaſing the leſs ſenſible Evacuations: But this muſt be uſed only in the decline of theſe Fevers, as has been juſt now ſhewn.

I have in this Place only determined the Order, and the ſeveral Degrees of the Efficacy of theſe Remedies (in the Cure of Fevers) with reſpect to one another: Their Kinds and Quantities being to be adjuſted by a former Analogy, I have given, when I was ſpeaking about the Advantages of Vomitting.

BUT here it may be very fairly aſked, why (ſince I make the Obſtructions of the *Artery* and *Nerve* which conſtitute the *Glands*, the principal Cauſe of Fevers) do not I allow Mercurial Medicines (which all grant to be one of the moſt proper, and perhaps *Specific* Remedies of Obſtructions) to be one of the Steps of the Cure of theſe Fevers?

BEFORE I anſwer this Queſtion, I ſhall, 1. Explain the Nature of Mercury. 2. I ſhall ſhew the Manner of the Operation of theſe Medicines; and, 3. The Advantages and Uſefulneſs of them.

I. *As to the firſt I ſuppoſe,*

1. THAT pure Mercury, or Quickſilver, conſiſts of Parts (I mean thoſe of the firſt Compoſition, by which I underſtand an Aggregate of the ſmalleſt and leaſt conſtituent Particles of any Body, and an Aggregate of theſe Aggregates I call of the ſecond Compoſition; and ſo on) exceedingly ſmall, equal, and perfectly ſpherical.

THIS has been ſuppoſed by all who have written any thing tolerable about the Nature of this Mineral. It is true indeed, ſome have ſuppoſed it ſo, becauſe they ſaw that dividing Mercury upon a plain (even by the Aſſiſtance of a Microſcope) ſtill the upper Part retained its Sphericity, which they could not ſo eaſily obſerve in other Fluids: But the true Reaſon of this is, The great Gravity of the Mercury, in reſpect of other Fluids, and the uniform Preſſure of the Medium. For all Fluids will retain their Sphericity till their Quantity be ſo diminiſhed (either by there being another Heterogeneous ſpecifically lighter Body included in them, or by their Gravity decreaſing at a greater rate than their Surfaces) that they are of equal Gravity with the unequal Portion of the Medium they are in, and then they will receive any Figure the Motion of the Medium can imprint on them. However the Diviſions of Mercury muſt be very ſmall, before it can be reduced to this State; but that it can at laſt be brought to it, is evident from the mixing and pounding of Quickſilver among common Water in which we know a Part of the Quickſilver is loſt, by the Diminution of its Weight, and the diſcolouring and effects of this Water.

BUT the true Reaſon why the former Suppoſition is to be made, is, becauſe from it ſome of the Phænomena of Mercury may be accounted for.

FOR, from thence it is evident, why Mercury (though the heavieſt known Fluid) riſes with fewer Degrees of Heat in an Alembic, than any other. 1. Its Parts (of the firſt Compoſition) being exceedingly ſmall, *i. e.* ſmaller than ſuch parts of any other Fluid, it muſt riſe ſooner than they; becauſe the Gravity of its Particles has a leſſer Proportion to their Surfaces, than the Gravity of the Particles of any other Fluid has to their Surfaces; for the Gravities of Bodies decreaſe in a Triplicate Proportion, whereas their Surfaces decreaſe only in a Duplicate one. Thus ſuppoſing (for Example) the Diameter of a Particle of Mercury (of the firſt Compoſition) to be to the Diameter of a Particle of Water (of the ſame Compoſition) as 2 to 300; (and we may juſtly ſuppoſe the Odds infinitely greater) their Surfaces will be as 4 to 90000. And their Solidities, *i. e.* their Gravities, as 8 to 27000000. This upon Suppoſition their Specifick Gravities were equal; but ſuppoſing (at the largeſt) the Specific Gravity of Mercury to that of Water, at 15 to 1. The real Gravities of ſuch Particles will be to one another, as 120 to 27000000: Whence it is evident, that not only the *Ratio* of 8 to 4, or 2 to 1, is much leſs than that of 27000000 to 90000 or 300 to 1. And therefore upon ſuch Suppoſition it will follow, That the Gravities of ſuch Particles of Mercury, would be much leſs than that of ſuch Particles of Water: And that the Surfaces of theſe Particles of Mercury, would be much larger, in Reſpect of their Gravities; than that of the like Particles of Water, in Reſpect of their Gravities; and conſequently the Mercury would riſe in the Alembic with much fewer Degrees of Heat, than the Water upon this Account. But, 2. The Particles of Mercury are perfectly Spherical and Equal; (for all Homogeneous Bodies muſt conſiſt of Particles *Similes & æquales* in the *Euclidean Senſe,* *Vide Def.* 1, 6, *&* 9. 11. *Euclid)* and conſequently can only touch in Points, and thereby their Sublimation will become more eaſy. A Sphere can be touched but by 12 other equal Spheres, and that too, but in ſo many Points; and if we ſuppoſe the ſuperficial Particles of the Mercury to be firſt raiſed in the Alembic, they can be touched only by 9 other. Now the Force and Value of ſuch a Contact as this of 9 Points, is leſs (*cæteris paribus)* than that of other ſolid Bodies generated by the Circumrotation of whatever Figure, Regular or Irregular, Right-lined or Curve-lined: For the Contacts of Circles is the meaſure of the Contacts of all other Figures whatſoever; and though in ſome Curves their Contacts in ſome Points, may be leſs than that of Circles *(vide Scholium Lem.* 11. *Princip. Phil. Mathem. Newtoni)*; yet in all their other Points, they will be proportionally greater, and conſequently the Value of the whole Contacts greater than that of Circles; wherefore it is evident, that Spherical Bodies will be more eaſily ſeparated than any other, and conſequently will riſe in the Alembic with fewer Degrees of Heat than any other. *I ſuppoſe,*

2*dly*. THAT the only Effect of the Sublimations, and other Preparations of Mercury, is the dividing it into theſe Parts of the firſt Compoſition, which are Spherical, *per Suppoſ.* 1. or into parts of a more complicated Compoſition, which (by reaſon of the vaſt Gravity of Mercury, in reſpect of other Fluids, and the uniform preſſure of the *Medium*) may be ſtill Spherical: For if the Mercury be pure, and no Heterogeneous lighter Body be mixed with it, it will ſtill retain its Sphericity, till the *Ratio* of the Surface of a Particle of Mercury to its Gravity, be to the *Ratio* of the Surface of a Particle of Air to its Gravity, as is the Specific Gravity of the Air, *i. e.* (putting the Specific Gravity of Mercury to that of Air, as m to n; and the Diameter of a Particle of Mercury x, and that of a Particle of Air a.) till $m : n :: \frac{1}{x} : \frac{1}{a}$; the x will be equal to $\frac{na}{m}$ that is, (ſuppoſing a equal to Unity as the Standard m to n as 10800 to 1 *proximè*, as all know) the Diameter of a Particle of Mercury muſt be 10800 Times leſs than that of a Particle of Air, or the Particles of Mercury themſelves, 1259712000000 Times leſs than theſe of Air, before they loſe their Sphericity. Now beſides theſe Diviſions into Spherical Particles, the Saline Bodies which are mixed with the Mercury in theſe Preparations keep theſe aſunder and disjoined; like ſo many congealed little Bullets ſeparated by the Fixation of ſome Liquor, This is (as I ſuppoſe) the whole effect of theſe Preparations; as is evident from what Mr *Boyle* and all other *Chemiſts* have found; to wit, that from all the Tranſmutations and Preparations of Mercury, they could elicit the ſame uniform heavy Fluid; which could never happen if there were any other (beſides the now mentioned) effect produced by theſe Preparations: For by what means ſoever you diſſolve this congealed Separation, the greater Gravity of Mercury brings its Particles into their former Union, and thereby reduces them into the ſame fluid Quickſilver. Beſides theſe two Suppoſitions, it is to be obſerved,

1. THAT the chief Ingredients in Mercurial Preparations are (beſides it ſelf) common and Armoniac Salts, and their Spirits, the Spirit and Oil of *Nitre*, *Vitriol* and its Spirit, and the like (which afterward we ſhall call by the General Name of *Saline Bodies*). All which (we know) are endued with a vaſt Power, to vellicate and ſtimulate the more ſenſible Parts of Animal Bodies, and (conſequently) to produce Vomittings and Purging (of themſelves) according to

their Quantity, and the Degrees of their natural Force.

2. THAT the only Effect of repeated Sublimations in theſe Preparations, is, the Diviſion of the Mercury into ſmaller Particles, and the freeing of theſe from the groſſer and more noxious Parts of theſe *Saline Bodies*; for Mercury, ſublimating more quickly and eaſily than theſe other *Saline Bodies*, muſt, in repeated Sublimations, have a greater Proportion to the *Saline* Mixture, than in the firſt Sublimations, and conſequently the ſubſequent Sublimations muſt have leſs of thoſe *Saline Bodies*, than the *antecedent*, whereby the Preparation will become ſweeter and leſs vellicating. This is evident from *Aquila alba & Panacea Mercurialis*, which are all much heavier (eſpecially) than any other Preparations of Mercury.

THESE things premiſed, I come to explain,

II. THE Manner of the Operation of Mercurial Medicines; in performing which I diſtinguiſh two Caſes. 1. Either the Medicine is taken inwardly. Or, 2. It is applied outwardly; under which Head I comprehend both Mercurial Inunctions and Plaſterings. As to the 1. After the Medicine is taken by the Mouth, it deſcends into the Stomach, and there the Saline Parts of the Compoſition vellicate the *Fibres* thereof, which occaſion thoſe Gripes felt upon the taking theſe Medicines: And if the Saline Particles have a conſiderable Share in the Compoſition, they ſo powerfully ſtimulate the *Fibres* of the Stomach, as to bring it into theſe Contractions, which produce Vomitting, as has been formerly explained: The Mercury itſelf, with ſome of the Remainder of the Saline Particles, ſlipping into the *Inteſtines*, do likewiſe vellicate theſe, and occaſion a gentle Purge; which Effect, though it be conſtant (in the firſt Days after taking theſe Medicines) yet it is never ſo violent as that of other Purgatives; becauſe moſt of its Force is ſpent in the Stomach. Now that both the Vomitting and Purging produced by theſe Medicines, are owing to the ſaline Parts of the Compoſition, is evident from the Nature of Mercury, and the Effect produced in it by the Chemical Preparations thereof juſt now explained: For Mercury conſiſting of Spherical Particles, and by ſuch Preparations being only divided into theſe of themſelves, (as being Spherical) theſe Particles could never occaſion the Stimulations, which (as has been formerly ſhewn) are neceſſary to produce theſe Effects. The only thing they can contribute towards them is, that by their exceſſive Gravity and Smallneſs, they are capable to diſſolve the Coheſion of the more viſcous Fluids of the Stomach and *Inteſtines*, and conſequently make them flow more eaſily, when the *Muſcular Fibres* of theſe Parts are otherwiſe brought into Contractions. Beſides, we ſee that the forementioned Effects, are moſtly produced by thoſe Compoſitions, in which moſt of theſe *Saline Bodies* enter. As in the corroſive Sublimate, the white and yellow Precipitate: But in the others, which paſs many Sublimations, (as the ſweet Sublimate, and the *Panacea Mercurialis)* we judge of their Goodneſs as they produce leaſt of theſe Effects. I aſcribe the Sweating produced by a Doſe of ſome of theſe Compoſitions, partly to the violence of the Vomitting, and partly to the Saline Particles which enter the Compoſition; and that ſmall Salivation, to the immediate Action of theſe *Saline Bodies* upon the Salivary *Glands*, and not to the Mercury itſelf. All theſe will be evident to any who have ſeen the ſudden Effects of theſe Medicines, which have not had ſufficient time, neither to enter nor circulate with the Blood, ſo as to be able to produce the mentioned Sweating or Salivation after the ordinary Manner. Thus I have endeavoured to explain the Effects of theſe Medicines while they are in the *Primæ Viæ*. I ſhall now ſhow the manner of their Operation in producing a *Flux de Bouche*, that thereby the leſſer Effects of this Kind may be underſtood.

THE Mercury being freed (by the Action of the Stomach, and the Heat of the Liquors contained in the ſame and in the *Inteſtines)* of moſt of the ſaline Part of the Compoſition, enters the Blood by the Lacteals, and is, with it, carried about through the Canals where either it, or any Liquor (of the Body) generated by it, flows, (the ſmall Remainder of theſe Saline Particles, which adheres to the Mercury after the Action of the Stomach and *Inteſtines*, aſſiſting the Propagation of the Motion, by the vellicating the ſides of the Canals) and having the ſame Celerity, but a much greater weight, it has conſequently a greater Force and produces a ſtronger *Ictus*, and thereby (when once any conſiderable Quantity thereof has entered the Blood) it (by its great Force, and the ſmallneſs of its Particles) diſſolves the unnatural Coheſions of all the Liquors, renders them more fluid and active, and likewiſe digs out all the Obſtructions of the impaſſable Canals like ſo many little Bullets ſhot againſt a mud Wall, every little Bullet breaks down a Part till the whole be levelled;

led; and this it is the more able to perform, both becauſe it is exceeding weighty, and makes therefore a greater and more forcible *Ictus*, and becauſe its Particles are exceeding ſmall, and are therefore to be conſidered as ſo many exceeding ſharp Wedges or *Cunei*. Beſides, by the ſmallneſs of its Particles it is able to enter into theſe ſlender Canals in which the Blood cannot freely paſs, and thereby to ſcour all the Paſſages be they never ſo ſmall. And that there are Canals, through which the Globules of the Blood cannot freely paſs, we are convinced from Microſcopical Experiments. Thus all the Liquors of the Body being attenuated, and conſequently their Celerity and Force rendered greater, and all the Canals ſcoured, and rendered paſſable, the whole *Glands* of the Body are ſet at work, and throw out the more noxious and leſs fluid Parts of their Liquors, (by Reaſon the Particles of the Mercury either diſſolve, or carry before them all the groſs Particles which reſiſt them) and thereby the Perſpiration, Urine, Salivation, are increaſed, and the quantity of the Fluids leſſened, and the whole Body emaciated, till there be nothing left but pure and uſeful Liquors, and clear and paſſable Canals. Thoſe who can only be convinced by ocular Demonſtration, may ſee a kind thereof in *Phil. Tranſ.* for *Jan.*

1700,

1700, where *Leeuwenhoek* from Microſcopical *Experiments* on *Tad-poles*, confirms the main of this Doctrine, as to the Manner of the taking away Obſtructions.

BUT there is another Effect of Mercurial Medicines, which is no ways to be forgotten; for beſides theſe mentioned Effects, it deſtroys that corroſive Faculty of the Liquors, which burſts the ſuperficial Veſſels, and produces thoſe conſtant Pains, Scabs, Ulcers, and the like, which we feel; For, ſuppoſing an Obſtruction in any Veſſel (either by the Corroſiveneſs or Viſcidity of the Liquor, or from ſome extrinſick Cauſe) the Liquor ſtagnates and coagulates there, and by the Force of the fluent Part of that Liquor, and by the Corroſiveneſs of the ſtagnated Part, the Veſſels are miſerably diſtended, and their Parts dilacerated, which occaſions conſtant Pain in that Part; or they burſt, and the Liquor putrifying, occaſions a Botch, Scab, or Ulcer, more or leſs dangerous and painful, as the Corroſiveneſs of the ſtagnated and putrifying Fluid is greater or leſſer. Now, this corroſive Faculty muſt proceed from the pointedneſs of the Particles (perhaps theſe Particles may conſiſt of four equilateral triangled Plains, for ſuch have the greateſt equal Degree of Acuteneſs on all their Points, which ſeems neceſſary to make them equable in their Actions, and homogeneous in their Natures) of the ſtagnated Fluid. Now, the Mercury will not only remove the Obſtruction, and make the Veſſel paſſable by its Weight, but likewiſe by the ſame will break off, and plain the Points and Angles of theſe Particles, and ſo render them harmleſs and innocent; for *Sublata cauſa*, &c.

But here it might be objected, that the grand Effect (as moſt People believe) of Mercurial Medicines is Salivation, and that really the Salivary *Glands* ſecern more of their Fluids proportionally than any other *Glands* of the Body, which is contrary to the 5. *Prop.* about Secretion. To this I anſwer,

1. That that the principal Effect of Mercury, is the attenuating the Fluids, the clearing the Canals, and the deſtroying the Corroſiveneſs of the Obſtructions, and that Salivation has no more Title to be the principal Effect of Mercury, than inſenſible Perſpiration: For all the *Glands* (notwithſtanding the Objection) ſecrete their reſpective Liquors in the Proportion mentioned in *Prop.* 5. about Secretion. 2. It is evident that Salivation is not the main Effect of Mercury, from this, That many Perſons

are cured of very dangerous Poxes, Ulcers, and Rheumatiſms, without ever ſalivating, at leaſt at the ordinary Rate of Salivation. But 3. The Reaſon why we ſeem to ſecern more by the ſalivary *Glands* proportionally, than by any or moſt others, are theſe, 1. The ſalivary *Glands* are more in Number than any of thoſe which ſeparate viſible Fluids; and conſequently it is but reaſonable they ſhould ſecern more than any other. It is true, the *Glands* of inſenſible Perſpiration are more in Number than thoſe; and it is not to be doubted, but they ſecern more likewiſe; and it will be found ſo whenever the Thing is examined after *Sanctorius*'s Method; but that Secretion not being viſible makes the Matter doubted. 2. The Canals which conſtitute the *Glands* of Salivation are evidently wider than theſe of others, as is clear from their ſpungy and ſoft Contexture; and ſo it is very accountable from their mentioned *Prop.* why they ſecern more plentifully. 3. The Fluid ſecerned in the Salivary *Glands* is ropy and viſcid, and one Part draws forward another, which does not happen in moſt other *Glands*, and upon this Account it is no Wonder, that thoſe ſecern more than theſe. 4. The Salivary *Glands*, in ſome People, have not ſo good a Contexture, and ſo obvious a Courſe, as in others: And this is the Reaſon, why ſome ſalivate little or none, and others too much. But 5. The true Account of the Matter is this, The *Saliva* being a tough ropy Subſtance, cannot be thruſt out ſo faſt, as the Mercury carries it forward, eſpecially ſeeing it ſeparates only the moſt glutinous Parts of this *Saliva*; whence all the ſalivary *Glands* begin to ſwell, until there be ſuch a Quantity accumulated, as, together with the Force of the Mercury, and of the ſucceeding Fluid, is able to burſt the Orifices of the *Glands*: And it is obſervable, the Salivation continues only ſo long, as any of the *Glands* are found ſwelled. Whence it is evident, that this plentiful Salivation depends upon this, That the Fluid is as it were laid up in Store, to be derived more plentifully afterward; whereas in the other *Glands* the Fluid being thinner, is ſecerned as faſt as it is driven forward: And hence it comes to paſs, that we think the *Saliva* ſecerned, is much greater in Quantity than what is derived from the other *Glands*. If we take in all theſe Conſiderations together, they will account for the plentiful Salivation by Mercury.

2. As to the ſecond Caſe. In Mercurial Inunctions the viſcid Matter, in which the Quickſilver is wrought and pounded, ſerves

only to keep the ſmall Particles thereof ſeparated and aſunder, and to apply them to the Skin, 'till by frequent rough Frictions the ſmalleſt Particles of the Mercury are forced through the Sides of the Cuticular *Arteries* into the Blood; and when once they are got thither, they are in the State juſt now mentioned, and operate after the Manner already explained. And indeed, this were the ſhorteſt and eaſieſt Courſe of raiſing a *Flux de Bouche*, if Mercury could be adjuſted to the Strength and Conſtitution of the Patient, (for the Quantity of Mercury, which will kill one, will not produce the deſigned Effect of Salivation in another) by this Method, as exactly as by adminiſtring it gradually in Doſes, by the Mouth. But it cannot be done ſo, and therefore the latter Courſe is the more ſafe.

MERCURIAL Plaiſters applied outwardly, to heal Scabs, or inveterate Ulcers, operate thus; The corroſive ſaline Mixture, if there be any Part thereof in the Compoſition, eats away and corrodes the putrid Matter, which ſears up the Mouths of the Veſſels; ſo that the Mercurial Particles get eaſily into them, where they both clear the Veſſel of the Obſtructions, and deſtroy the Pointedneſs of the Particles of the Fluid, which two things did concur to make the Ulcers ſore. If there be no Saline Body in the Application, then the Mercury muſt be forced in by Friction, into the Maſs of the Blood, to produce the deſigned Effect.

THUS, from a few eaſy and evident *Poſtulates*, I have given an intelligible Account of the Manner of the Operation, and of the Effects of Mercurial Medicines, when the Mercury enters in any Quantity into the Maſs of the Blood, and from thence it will be eaſily underſtood, that when the Quantity is leſs, the Effects will be proportionally leſſer; ſo that it will be needleſs to explain all the ſeveral Degrees thereof by Detail. But ſeeing it is evident, from *Leeuwenhoek*'s Obſervations in the laſt mentioned *Phil. Tranſ.* that the Force of the Blood is able to waſh away ſome Obſtructions; let us take a groſs Eſtimate of the Proportion of the Efficacy of the Blood aſſiſted by Mercury, to the Efficacy of the Blood itſelf and unaſſiſted, to take away Obſtructions. Firſt, then, we muſt conſider, if inſtead of the ordinary Liquors there paſſed nothing but Mercury in the Canals of the Body; the Weight of Blood being to that of Mercury, as 1032 to 14593, or as 1 to 13 at leaſt, and their Velocities being the ſame, Mercury would at leaſt be 13 times more able to remove the Obſtruction, than the Blood of itſelf: But it is certain (if the Obſtruction renders the Canal impaſſable) there can no Particle of the Mercury get away; and (when there is any Quantity thereof got into the Blood) there are ſtill ſome new Particles thereof coming up, ſo that after ſome Time (they having a greater *Momentum* than the *Globules* of the Blood, and thereby getting through it up to the Obſtruction) we may conſider, there will be little or nothing, ſave Mercurial Particles, at, or near, the Obſtruction, driven againſt it, by the whole Force of the Blood; ſo that, as to the Obſtruction itſelf, it is very near the ſame, as if the whole Canals run Mercury. However, let us take the Proportion only as 1 to 10; ſo that upon this Account the Blood, aſſiſted by any conſiderable Quantity of Mercury, will be 10 times more able to remove the Obſtruction than the Blood unaſſiſted.

Secondly, Let us conſider, the *Globules* of the Blood are Elaſtic (for they often loſe their Figure in ſtrait Canals, and recover it again, as *Leeuwenhoek* has ſhown, which is the Definition of Elaſticity) and thoſe of Mercury are not, or very little ſo: And conſequently upon this Account, the Efficacy of the *Globules* of Blood will be hugely diminiſhed. Let us ſuppoſe it loſes $\frac{1}{2}$ of its Efficacy (which is a liberal Allowance) and then the Proportion will be $\frac{3}{4}$ to 13, or 3 to 40.

Thirdly, Let us obſerve, That the *Globules* of the Blood, and Mercury driven againſt the Obſtruction, and at every Pulſe digging away a Part of the ſame, may be conſidered as *Cunei*. Now, *cæteris paribus*, the Force or Efficacy of *Cunei* is reciprocally proportional to the Angles their Edges make. But in Spheres, the leſſer or greater Degree of Curvity is to be conſidered as theſe Angles, when theſe Spheres are conſidered as *Cunei*: And Degrees of Curvity in Spheres (as in Circles) are reciprocally as their *Radii*. Suppoſing then the Diameter or *Radius* of a Particle of Mercury is to that of a *Globule* of Blood, as 1 to 100 (and there can be Reaſons given, ſome of which I have formerly hinted, why the Odds may be ſuppoſed much greater) then the Force of the Mercury, and the Blood, to that of the Blood unaſſiſted, to remove Obſtructions, will be as 4000 to 3. Laſtly, let us conſider, that by the Force of the Mercury, the Liquors of the Body are exceedingly attenuated, and rendered more moveable, and are thereby capacitated to receive a ſtronger Impreſſion; ſo that they both move more quickly, and with greater Force, as is evident from the Pulſe of thoſe who are under a *Flux de Bouche*, whoſe Pulſe is little leſs frequent and ſtrong, than the Pulſe of thoſe in a Fever. Let us ſuppoſe the Proportion, both of the Frequency of the Pulſe, and of its Strength to that of an ordinary one, as 3 to 2, (and this is certainly much leſs than the Truth) then it will be as 3 to 2, upon the Account of its greater Force; and again as 3 to 2, upon the Account of its greater Frequency, that is as 9 to 4. So that now upon this laſt, and all the former Accounts, the Proportion of the Efficacy of the Blood, aſſiſted by any conſiderable Quantity of Mercury, to that of the Blood unaſſiſted, to remove an Obſtruction, will be as 36000 to 12, or as 3000 to 1. So that the firſt will be 3000 times more effectual for that End than the latter. But if any ſhould ſtill think we have made too liberal Allowances for the Mercury, let us rebate the Proportion one third Part; yet ſtill the Blood, aſſiſted by any conſiderable Quantity of Mercury, will be able to do as much toward the Removal of an Obſtruction in one Day, as the Blood unaſſiſted in three Years almoſt.

BESIDES, there are a great many Caſes in which the Blood unaſſiſted, is ſo far from being able to remove the Obſtruction, that it will continually increaſe the ſame: For if the Obſtruction proceed from a Depravation of the Liquors of the Body, as in *Rheumatiſms*, or if ſome corroding Matter, be forced into the Liquors, ſo as to be able to vitiate the ſame, as in Poxes, Peſts, and Poiſons, it is demonſtrable, that (without ſome external Aſſiſtance, either by Diet or Medicines) the Malady, inſtead of mending by Length of Time, will increaſe. But if the Obſtruction proceed from ſome external Injury, as in Bruiſes, Wounds, Colds, and (perhaps all continual) Fevers, the Liquors (ſtill perſiſting in their natural and wholſome State,) may do much to drive away the ſame by Length of Time; but ſtill the ſooner, and more ſafely, if they be aſſiſted by convenient Medicines. I come to,

III. The Advantage and Uſefulneſs of Mercurial Medicines.

And, 1. They are uſeful for deſtroying the Viſcidity and Thickneſs, the Corroſiveneſs and Pointedneſs, of the Particles of the whole Liquors of the Body, rendring them fluid and moveable, innocent and harmleſs, if before they were otherwiſe.

2. THEY are evidently uſeful for removing all Obſtructions, Ulcers, Scabs, Botches, Swellings, conſtant Pains, (all which are but the Effects of ſome kind of Obſtruction or other) of whatever Nature or kind, by adjuſting only their Quantities rightly, but that is the Work of an able Phyſician.

Now, for anſwer to the Queſtion which gave Occaſion to this Diſcourſe: Mercurial Medicines were exceedingly uſeful, and would anſwer the whole Deſign in curing Fevers, were it not upon theſe two Accounts. 1. Before they could be effectual for this Purpoſe, they ought to be adminiſtred in a large Quantity, which never miſſes (by the Violence and Force of the Motion of the Blood thereby occaſioned) to induce a new Fever in a Patient, of it ſelf; ſo that inſtead of curing the former Fever it would double it, and make the Danger double, which by no means is to be done; the Patient having enough to do to wreſtle with one. But, 2. It requires ſo long time to bring the Effects of Mercurial Remedies to any Height, that the Patient (in ſo long a ſpace) would be cured by the Force of Nature, or killed by the Violence of the Diſeaſe; ſo that upon this Account they are rendred uſeleſs. Beſides there are a thoua thouſand other Inconveniences which render this Method, in its full Force, altogether impracticable.

AFTER all, I remember to have been told (ſome time ago) by that Eminent Phyſician of our Country, (whom I have thrice already mentioned) that People who have been ſeverely fluxed, ſeldom fall into dangerous Fevers; and that in Fevers of Children occaſioned by Worms, Mercury, if diſcreetly us'd, is always (and in ſome Fevers of riper Years, is often) very ſucceſsful. The Reaſon of both which is very evident from our Doctrine.

FOR, in thoſe who have been ſeverely fluxed, the Blood is ſo purified, and rendered ſo fluid, and all the Canals are ſo cleanſed and ſcoured, that if at any time there ſhould happen ſuch Obſtructions as occaſion Fevers, Nature is able in a ſhort time to drive them away, ſeeing they muſt rather happen from ſome external Cauſe, than from within, where all is clear and paſſable.

As for Fevers occaſioned by Worms among the Fluids in the Bodies of young Perſons (which by the way is an Argument omitted for our Theory of continual Fevers, as is likewiſe the *Febris Variolarum*, both which are occaſioned by Obſtructions, as is evident from the Botches which break out upon the latter, and as ſhall be juſt now ſhown of the former): For here a little Worm being forced into ſome of the capillary *Arteries*, where it can neither get back nor forward, totally occludes the Paſſage of the Blood, and thereby occaſions a Fever after the manner already explained. Now the Reaſon, why the natural Force of the Blood is not able to remove ſuch an Obſtruction is, becauſe a living Creature makes it, which will not be mouldred away after the manner of coagulated Blood, but will require the greater Weight, and force the Mercury to kill it firſt, and then both the Mercury and Blood concurring, waſh it away.

THE

THE APPLICATION TO THE General Propoſition TO HECTIC FEVERS.

HAVING in the former part of theſe Papers, treated Continued Fevers ſo, as to comprehend the general Symptoms which are common to each kind; ſhewing how the common Appearances of each may be accounted for, from an Obſtruction of the Canals which conſtitute the *Glands*, and thereby an Augmentation of Quantity of the Blood in the paſſable ones; and how all the Changes of the Motion and the Qualities of the Blood neceſſary towards a true

Theory of Hot Fevers, did naturally follow from thence; ſo that the general Doctrine may eaſily be applied to all the Varieties of continued acute Fevers. I ſhall now endeavour to ſhew, how the Appearances of ſlow conſumptive Fevers in general, and of *Hectic Fevers* in particular, may be deduced from the other part of the general Propoſition; *viz.* from a Dilatation of the Conſtituent Veſſels of the *Glands:* In order to which, I premiſe the following

Lemma III.

Cæteris paribus, The Strength of different Animals of the ſame Species, or of the ſame Animal at different Times, are in a triplicate Proportion of the Quantities of the Maſs of their Blood.

Demonſtration.

IT is evident from the Animal Oeconomy, that the Augmentation or Increaſe not only of all the Fluids, but likewiſe of all the ſolid Parts of the Body, is owing to the Blood, and that the ſame (all other things being equal) is proportional to the Quantity thereof; and it is certain from infallible Experiments, that (whatever be the Cauſe of Muſcular Motion) the Blood it ſelf, the *Liquidum Nervorum*, and the Muſcles, (*i. e.* a bundle of Muſcular Fibres, and the Integrity of the ſame) are only and abſolutely neceſſary to the Action of the ſaid Muſcles; for, put any two of theſe, and entirely take away the third, no Motion will follow: Wherefore the Forces of any one, or of all the Voluntary Muſcles, *i. e.* the ſtrengths of Animals, are in a compound Proportion of all theſe three. But the Quantity of each of theſe three, in this caſe depends upon, and is in Proportion to, the Quantity of the maſs of the Blood, as has been juſt now ſhewn: And therefore the Strengths of different Animals of the ſame Species, or &c. *q. e. d.*

Scholium.

IT is not ſo eaſy to compare the ſtrengths of different Animals of the ſame Species, as to compare the Strengths of the ſaid Animals at different Times; for in the firſt caſe, before the foreſaid *Lemma* can obtain, it is neceſſary they be of the ſame Age, Stature, Diſpoſition, and Conſtitution, all which Conditions are hardly found or made evident to be ſo: But in the latter it is neceſſary only, that the Animal gently and inſenſibly increaſe or decay, as in the ſame Animal, Young and Old, and betwixt the two. But whether in the ſame, or different Animals, if theſe Conditions were equal, it were eaſy to determine the Proportion of their Strengths; for then, opening the ſame Vein or Artery in both, making (as near as may be) the ſame Orifice and and Ligature in the ſame Place of the Vein or Artery; obſerve the Quantities of Blood emitted at the ſame Time. The whole of the maſſes of their Blood ſhall be as the Quantities emitted, and conſequently their Strengths in a Triplicate Proportion of theſe.

Corollary.

HENCE the Reaſon is evident of the Diſproportion of the Strengths of the ſame Perſon, a Boy, and old Man, in the mean betwixt the two, and in a Fever, although the Odds betwixt the Quantities of his Blood, at theſe different Seaſons, be not ſo great; for, let the Quantities of his Blood, in the ſame Order I have named them, to be 10, 15, 20, 30 Pounds, *i. e.* their Proportions, 2, 3, 4, 6, his Strength ſhall be in theſe Proportions, 8, 27, 64, 216; how this Proportion ſomewhat abated, ſerves to account for the Weakneſs of Hectic People, ſhall be afterward ſhewn.

Pro-

Propoſition.

THE general and moſt effectual Cauſe of Hectic Fevers, is a Dilatation of the conſtituent Veſſels of *Glands*, (or to expreſs it more univerſally, as it may be done in the other particular Propoſition) of the Conduits of Secretion.

SUPPOSING a Dilatation of the Conduits of Secretion, it will follow, as a Corollary, that the Quantity of all the Fluids of the Body may be ſuppoſed thereby diminiſhed, in any given Proportion of Minority to the whole of theſe: For, from the ſaid Dilatation ſuppoſed, there will follow a greater Velocity of the Fluids contained in the Canals of the Body, as ſhall be afterward demonſtrated: And ſince, by the 5th Propoſition about Secretion, the Quantity ſeparated is in a compounded Proportion of the Velocity of the Fluid, and of the Orifice; both theſe being augmented, the Quantity of the Separation muſt be proportionally augmented, and conſequently, the Quantity of the remaining Fluids proportionally diminiſhed; ſo that merely upon this Account, when a Perſon falls into a *Hectic* Fever, we may ſuppoſe the Quantity of his Blood (becauſe it is from the reſt of the

Fluids, which we are ſpeaking of, generated) to be conſiderably abated: Let us ſuppoſe him from 20 Pounds in his ordinary State, to have dwindled into 16; then, by *Lemma Primum*, and its *Scholium* $\frac{a\,a}{a+6}=$ 12 Pounds, in caſe of a Subduple Dilatation; and $\frac{a\,a}{a+6}=12\frac{4}{5}$ Pounds, in caſe of a Subtriple one, *i. e.* if there be (upon the aforeſaid Account) ſuppoſed but 16 Pounds of Blood in a Hectic Perſon, as the *Media Quantitas*, and that to the Cylindrical Canals (equal to the whole Veſſels of the Body, ſave the Inteſtines and Lacteals) there be added another, whoſe Orifice is equal to one half of the former, (*i. e.* if the Veſſels be dilated in their Orifices one half) then the Quantity of 16 Pounds of Blood in theſe ſo dilated Veſſels, ſhall be but like 12 Pounds in theſe Veſſels, if they had not been dilated, and produce but ſuch Effects, as ſuch a Quantity would do in the Canals, if they were in their ordinary State; and ſo in other Dilatations. From both theſe Conſiderations it is clear, we may ſuppoſe the Quantity in all Fluids of Hectic People abated at any required Rate of Minority.

COME we now to ſolve the Appearances of Hectic Fevers. From the Dilatation of the Conduits of Secretion, and the Diminution of the Quantity of all the Fluids, and of the Blood eſpecially, it follows:

§. 1. THAT the Velocity of the Blood will be greater, and conſequently the Pulſe more frequent and quicker. The taking away an *Impedimentum* from one Side, is equivalent to (the Circumſtances continuing the ſame as formerly) the adding an equal *Momentum* on the other: Wherefore, if I ſhew, that the *Impedimenta* to the Motion of the Blood, are (by theſe) taken away, it muſt follow, that the Motion and Velocity thereof muſt be augmented. This I ſhall do in theſe three Particulars, 1. It is certain that one great Reſiſtance to the Motion of the Blood, at the Heart, or in the Arteries, is the precedent Blood in the Arteries, continued through the Veins to the Heart and Arteries again; for the preceding Blood always hinders the ſucceeding, ſeeing before the one ſucceed in its Place, the other muſt be removed: And this Reſiſtance is always proportional to the Quantity of the Maſs of the whole Blood; but the Quantity of the Blood being diminiſhed, this *Impedimentum* muſt be proportionally diminiſhed, and conſequently the Velocity of the reſt, greater. This we evidently perceive in the Time of Blood-letting. 2. Another principal Reſiſtance of the Motion of the Blood, is the ſtriking of the Particles of the ſame againſt the Sides of theſe Veſſels, eſpecially Conical ones; now the Dilatation of theſe Veſſels will much leſſen this Reſiſtance, upon theſe three Accounts. 1. The Veſſels being dilated, the Cylinder, whoſe Baſe is the perpendicular Section through the Axe of the narroweſt Paſſage of the Canal, will thereby be augmented, and conſequently many more Particles, than otherwiſe, get free, without ſtriking againſt the Sides of Canals. 2. Thoſe who do not ſtrike, are removed to a greater Diſtance from the Sides of the Canal; *i. e.* their Motion is quicker; for, in this Caſe, the Sides of the Veſſel are as *Fulcra*, and the greater Diſtances as longer *Vectes*, and conſequently the Celerity as theſe *Vectes*. 3. The Surfaces of little Things have a greater Proportion to their Bulks or Solidities, than thoſe of greater Things to theirs; and therefore the internal Surface of a ſmaller Veſſel, will be greater in reſpect of its contained Fluid, than thoſe of a greater Veſſel in reſpect of its, and conſequently againſt the internal Surface of this dilated Canal, fewer Particles of the Blood will ſtrike, than againſt the ſame when it was narrower. III. A third Reſiſtance to the Blood, is the Preſſure of the circumambient Muſcles, Bones, Tendons, and diſtended Canals, which do ſurround the Arteries (many of them) on every Side, and drive the Sides thereof inward: Now this is entirely taken away, by the Emaciation and Conſumption of theſe ſolid Parts, which always precede Hectic Fevers. And, IV. Beſides all theſe, the Velocity of the Blood muſt be increaſed; becauſe (as ſhall be juſt now ſhewn) it is dryer, hotter, and more ſaltiſh than ordinary, and conſequently it will (by the ſtimulating Quality following upon theſe) bring the Heart into more frequent Contractions, and increaſe the Propagation of the Blood in the Arteries. Now from all theſe, it being evident, that the Velocity of the Blood is greater, it follows: 1. That the Pulſe muſt be more frequent; for the Heart being an involuntary Muſcle, its conſtant Motion muſt, and does, depend upon the Influx of the *Liquidum Nervorum*, forced into it by the Arteries running upon the Nerves in the Brain; every beating of the Artery, forcing the *Liquidum* into the Muſcle of the Heart, whereby it contracts, and the Velocity of the Blood being greater, this Influx muſt be more frequent; *i. e.* The Heart muſt contract oftner, and the Arteries likewiſe; for the Contraction of the Heart, and the

Frequency of the Pulſe, is always proportional to the Velocity of the Blood. 2. It muſt be quicker, becauſe by the great Velocity of the Blood, it ſtays but a ſhort Time in the Expulſions of the Artery outward; *i. e.* it does not continue any long Time forcing the Artery againſt the applied Fingers,

§. 2. THOUGH the Pulſe be frequent and quick, yet it muſt be weak; this is evident upon theſe two Accounts. 1. The Quantity of the Blood being ſmall, the Arteries not being diſtended therewith, cannot be driven ſo far outwardly as ordinarily; and the *Ictus* of all unbending ſpringy Bodies, *cæteris paribus*, being proportional to the Degrees of their being bended, the *Arteries* by this Defect of Blood being leſs bended or contracted than ordinary, muſt ſtrike more weakly againſt the applied Fingers. 2. The Arteries not being ſo much bended as ordinarily, muſt likewiſe ſtrike forcibly upon the Nerves running by them, and therefore a leſs Quantity of the *Liquidum Nervorum* will be forced into the Heart, and conſequently the Heart contract leſs forcibly: *i. e.* the Pulſes muſt be left weaker.

§. 3. THE Blood muſt be dryer, more groſs, and more ſaltiſh, than ordinary; for the Canals being wider, *ex Hypotheſi*, and the Velocity of the Blood greater *per* § 1. the Evacuations muſt be proportionally greater *per Prop.* 5 *de Secretione*, and ſeeing, *per ejuſdem* 3. the Parts of leaſt Coheſion and greateſt Fluidity, *i. e.* the thinneſt, moſt humid and aqueous Parts, are firſt ſecerned, and moſt eaſily; therefore the dryer and groſſer Parts will be laſt ſecerned; *i. e.* the remaining quantity of the Blood will be dryer or leſs humid, groſſer or leſs thin, and conſequently more ~~leſs~~ ſaltiſh.

§. 4. THERE muſt be felt ſomewhat a greater Heat than ordinary, eſpecially about the Arteries and Hypochondres. There muſt be a greater Heat than ordinary, felt over the whole Body, for theſe Reaſons: 1. The Blood has greater room in the Canals, (they being ſuppoſed dilated) and conſequently the Heat will have more Liberty, and not be ſo much pent up as ordinarily; and therefore it muſt break out more plentifully from the Particles of the Blood communicated by the greater Velocity thereof. 2. Suppoſing no greater Heat than ordinary in the Body, yet it will be felt greater becauſe (the Conduits of Secretion being dilated) the Heat which is in the Body has a freer Egreſs outward, and muſt ſtream out more abundantly upon any Thing which touches the Skin of the Hectic Perſon. 3. The Blood is more dry and ſaltiſh than ordinary, *per* §. 3. and therefore, upon this Account, there will be felt a greater Heat. This Heat is greater about the Arteries, becauſe the Celerity of the Blood there being greateſt, muſt there moſt plentifully diſentangle the Heat from the Particles of the Blood wherein it is lodged, and greateſt in the right *Hypochondre*, becauſe there moſt of the Liver is ſituated (which is the Laboratory of the Bile) which ſecerning commonly a hot ſaline Fluid muſt be much more ſo now; likewiſe betwixt both *Hypochondres*, are the *Spleen* and *Pancreas* placed, in which, on this Occaſion, a more than ordinary Heat may many Ways happen. This Heat, whether univerſal or particular, is ſcarcely ever felt by the Patient, both becauſe it is a great deal more moderate than that of acute continued Fevers, and becauſe a long Habit and Cuſtom has made it inſenſible, as they do in all other Things.

§. 5. THE Reaſon of the Increaſe of the Frequency of the Pulſe, and of the Heat after eating is eaſy from theſe Reaſons. 1. Becauſe there is a greater Plenty of the *Liquidum Nervorum* generated, which will make the Heart contract more frequently; *i. e.* will make the Pulſes quicker: And, 2.

Becauſe the Chyle entring into the Maſs of the Blood, will be immediately (becauſe of the Velocity of the Blood) divided into minute Parts, and the Heat thereby diſengaged *i. e.* the Body will be hotter *per* §. 4. And both theſe Effects will continue as long as any of the Effects of the Repaſt remains.

§. 6. The vaſt Decreaſe of Strength is evident from *Lemma* 3. It is true indeed, the Increaſe of the Velocity of the Blood, demonſtrated §. 1. will ſomewhat abate the Proportion there given; but we muſt conſider, though the Celerity of it be conſiderably great, yet the Quantity thrown into any determined Part of the Body at one Contraction of the Heart (which is all that is here uſeful) is very ſmall: Beſides, there is a great Difference betwixt the Motion of the voluntary Muſcles (which is the proper Eſtimate of Strength) and that of the involuntary ones, ſuch as the Heart; for the Pulſe may be very quick, from ſuch Reaſons as I have ſhewn, §. 1. and yet the Patient very weak; ſo that from theſe it is clear, that there is no great Occaſion for abating any Thing of the aforeſaid Propoſition; however, giving as much as may be required, ſtill there is ſufficient in this *Lemma* to ſatisfy this Appearance.

§. 7. FROM this Decreaſe of Strength, *i. e.* Weakneſs, it is clear, why Perſons labouring under a Hectic Fever, are unwieldy, unactive, and, as it were, ſluggiſh.

§. 8. THE Urine of Hectic People has the ordinary Colour, but it is greater in Quantity in Proportion to their drinking, *per* 3 and 4 *Prop. de Secret.*

§. 9. LASTLY, It is evident from what has been ſaid, that if theſe Symptoms be not removed, they will neceſſarily increaſe, even into thoſe Heights, which they call the Second and Third Degrees of theſe Fevers, till they end in an entire Extenuation and inevitable Death. This needs no Proof.

I. THUS, from the Suppoſition, of a Dilatation of the Conduits of Secretion, I have accounted for all the Appearances of this Kind of Fevers, which is one Argument for the Verity of our Doctrine.

II. FROM the ſame ſuppoſed Dilatation, I have ſhewn how the Blood will neceſſarily become hotter and drier, which are all the *Data Bellini* requires to account for theſe Fevers, which is another Argument.

III. THE Antecedents of Hectic Fevers, ſuch as are violent Evacuations by Urine, Stool, or Sweat, *&c. Ulcers* in the *Throat*, *Lungs*, *Kidnies*, *Womb*, &c. A hot and dry Diſpoſition, precedent long-continued acute Fevers, Drunkenneſs, Madneſs, *&c.* In ſhort, every thing that conſumes the Humidity of the fluid or ſolid Parts; I ſay, all theſe produce a Dilatation of the Veſſels theſe two Ways. 1. They ſpend and conſume the ſolid Parts, by withdrawing their Humidity, ſo that theſe ſhrink in and contract, and conſequently do not preſs ſo much upon the ſurrounded Canals, and thereby they have Freedom to be dilated, as far as the Force of the contained Fluids can diſtract them, or as they naturally of themſelves will unbend; for the Canals are forcibly contracted, (by the Muſcle of the Heart and their own Muſcular Fibres) but naturally and of themſelves, they widen and unbend. Now, though the violent Evacuation be but in one particular Place of the Body, yet by the *Æquilibrium* which is kept in the internal Fluids of the Body, as well as the external ones, all the others will ſuffer by it; for all, or moſt of the Fluids of the Body will be drawn toward that Place, till the conſuming Part be brought into an equal Condition (as to Augmentations or Nouriſhment, over and above what is violently expended) with the reſt, and therefore all the Parts will conſume equally. 2. The ſolid ſurrounding Parts thus giving way, the Canals will naturally unbend themſelves, and will be aſſiſted thereto, by the force of the Fluids therein contained: And generally we obſerve Night-Sweatings immediately to precede ſuch Fevers, which effectually opens moſt of the Conduits. Thus both theſe Ways the Conduits of Secretion are dilated, by the Antecedents of Hectic Fevers, which is not an Argument for, but a Demonſtration of the Verity of our Theory.

4. A FOURTH Argument, is from the general Principle and Foundation of the Cure of ſuch Fevers, (for taking firſt away the Occaſion of the Diſtemper if they be ſymptomical, that nothing may remain but the ſimple Hectic) they are always cured by ſuch things (which being eaſily digeſted, and ſuited to the Weakneſs of the Stomach of the Patient, made ſo by this Malady) as do moſt augment the ſolid Parts, and conſequently ſtraiten and contract the Canals again.

5. Lastly, The Appearances upon the opening of ſuch Perſons as are cut off by Hectics do evidently confirm our Doctrine; for beſides other things (as Ulcers, Gangrenes, and the like) we ſtill obſerve large lank Canals, big Veſſels, ſlender Muſcles, and little Blood.

Much more might be added on this Head, but theſe are ſufficient, elſe twice ſo much will not ſuffice.

A General Method for examining the Quantity of the Augmentation, or Diminution, of the Maſs of Blood, ariſing from an Obſtruction or Dilatation of the Conduits of Secretion.

FOR avoiding Confuſion in the following Calculation and Diſcourſe, I ſhall only name the Effects of an Obſtruction, becauſe any one, who pleaſes, may eaſily, with the Help of the immediately preceding Part of theſe Papers, apply the ſame Method of Reaſoning, *mutatis mutandis*, to a Dilatation of theſe Conduits, the firſt being contrary almoſt in every Thing (here eſpecially mentioned) to the latter.

THAT all continued acute Fevers are produced by the Obſtruction of the Conduits of Secretion, is ſo very evident, that none who obſerves, that any long continued Retention of theſe Things, which are uſually, and in an healthful State, ejected out of the Body, (which is infallibly occaſioned by an Obſtruction of theſe Paſſages through which they ought to come) never miſſes to produce a Fever, more or leſs violent, can be ignorant of the ſame. Now the primary and immediate Effect of ſuch Obſtructions, is the Augmentation of the Maſs of the Blood; becauſe every thing ejected out of the Body (the Fæces only excepted) is derived from the Blood, therefore the Quantity of the Blood will be augmented, by ſo much as is the Quantity of that which ought to be ejected. Theſe Obſtructions augment the quantity of the Maſs of the Blood, theſe two ways. 1. By keeping within the Body thoſe Parts of the Blood, which naturally are ejected: Suppoſe the Paſſages of Perſpiration and Urine were obſtructed for one Day, in which a Man ſhould take his ordinary Refection, certainly the Maſs of the Blood would be augmented, by ſo much as is the Sum of the Quantities, commonly evacuated by Perſpiration and Urine one Day, and that too by ſuch a Quantity of Things, of ſuch an ill Quality as Nature does not think them fit to be lodged in the Body of an healthful Perſon. If one ſhould take his ordinary Quantity of Meat and Drink for ſome Days, and theſe Obſtructions continue, the Maſs of the Blood would be increaſed by ſuch a Quantity of vicious Matter, as is the Sum of both theſe daily Evacuations multplied into the Number of Days the Obſtruction continues. But let us ſuppoſe, that the firſt Day's retention of this vicious Matter, does ſomewhat indiſpoſe the Patient, ſo that he will not able to eat or drink ſo much the next Day; let this next Day's Repaſt have any given Proportion to, or be different from, the former Day's Repaſt, by any given Quantity, and let theſe Obſtructions, and this *Ratio*, or Difference, continue for any Number of Days, the Maſs of Blood will be augmented by a vaſt Quantity of vicious Matter: How to find the Sum thereof, I ſhall preſently ſhew. It is true indeed, Nature (by the *Æquilibrium* generally kept in the Fluids of the Body) has wiſely provided that the Diminution or Suppreſſion of one Evacuation, ſhould be the Augmentation of another, elſe we could not continue well one Day to an end: But it is likewiſe true, that this is not always ſo, at leaſt not entirely; which is ſufficient to our Purpoſe, and, therefore, whenever this Caſe happens, it muſt infallibly augment the Maſs of the Blood.

But, 2. not only is the Blood by this Retention augmented, but a great many of the ordinary Paſſages being obſtructed, occaſions the Blood only to flow in the paſſable ones; whereby it is ſo accumulated there, as to augment the quantity thereof, in the paſſable ones to a huge degree. But having already in the firſt *Lemma*, and its *Scholium*, ſufficiently conſidered the Augmentation ariſing from this Conſideration, I ſhall now ſhew how to calculate the Increaſe ariſing from the former.

1. LET r to s repreſent the *Ratio* of an ordinary Man's eating and drinking in one day, to his Evacuations more or fewer in the ſame; let a repreſent the ordinary Quantity a Man eats and drinks in one Day, x the difference of his eating and drinking one day from another, upon the occaſion of an Indiſpoſition ariſing from any Obſtruction, or Retention, of the uſual Evacuations; and let this difference be conſtant for ſome days, y the number of days in which he takes any Refection at all; then the quantity of vicious Matter, by which the Maſs of the Blood is augmented, ſhall be

$$= \frac{2asy + sxy - sxy^2}{2r}$$

2. IF from the Difference of his daily eating and drinking given, you would

deſire the Number of days in which this Retention ſhould amount to any given Quantity; ſuppoſe *c*, then you may have it from the Solution of this Æquation $y^2 = \frac{x + 2a}{x} \quad y \, \frac{2cr}{sx}$, wherein x is given from y, and y from x.

3. SUPPOSING the ſame Quantities continue as they are, only with this Difference, that a Man eat nor drink leſs every day at a certain Rate, and not in a given Difference, *i. e.* the decreaſe of his Refection being formerly in an Arithmetic Progreſſion, let it be now in a Geometric one, let the *Ratio* of this laſt Progreſſion be m to n, or $\frac{m}{n} = x$; Then the Quantity of vitious Matter, by which the Blood is augmented in this Caſe, is $y + 1 = \frac{a^2 sx - a^2 sx}{arx - arx} y$; where y or $y + 1$ is the Exponent of x.

4. IF you deſire this Quantity to be equal to c, as in the former Caſe, then the Solution of this Æquation $Xy =$

$\frac{adr}{adr+a^2s}$ X $y-1\,\frac{a^2s}{adr+a^2s}$, will will give x or y from either of them ſuppoſed known: If you deſire x from y given, you muſt ſolve an Æquation denominated by y; if from x given, you want y, you ſhall have it by a Table of Logarithms; for, put l to ſignify the Logarithm of any Quantity, $Y = l\,x\;l$, $\frac{adsx}{a^2sx - adrx}$, that is the one Logarithm divided by the other

5. If you would have the full Effects of theſe Augmentations, you muſt add theſe found out in the firſt and third Steps to the natural mean Quantity of the Blood, *viz.* 20 Pounds, and then apply the Æquation found out in the firſt *Lemma*; calling the Sum of both theſe Quantities *a*. Thus let the 20 Pounds of Blood ordinarily found in a Man, together with the Augmentations (found in the firſt and third Steps) by Reaſon of the Retention of the ordinary Evacuations be called *a*, then, *per Lemma* 1, the true value of the whole Maſs of the Blood, in reſpect of the

paſſable Canals, ſhall be $= \frac{a^2}{a-6}$.

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6. IF you deſire this Quantity ſhould be equal to a given one *c*, then $6 = \frac{aa-ac}{c}$, and $a-b=\frac{a\,2}{c}$, which are all the poſſible Varieties of theſe Caſes. The ſame, with the greateſt Eaſe imaginable, may be applied to a Dilatation.

The Application to the general Calculations of ſome particular Caſes.

WE all know, that in a continued hot Fever, the Perſpiration is almoſt or altogether ſuppreſſed not only ſome time before, but very often, during the whole time of its Period. And *Sanctorius* in the 6th Aphoriſm of his 1ſt Sect. ſays, That if the meat or drink taken in one day; amount to 8 Pounds, the inſenſible Perſpiration, will be 5 Pounds: Hence the Proportion of the daily Repaſt to the Perſpiration, is as 8 to 5, and the Quantity taken by the Mouth is 8 Pounds. Let us ſuppoſe he takes 6 Pounds of meat and drink the next day, the third 4 Pounds, and the fourth 2, and on the fifth he falls ſick of a Fever, then by the firſt Step of the general Calculation, the Maſs of the Blood will be augmented by

$12\frac{1}{2}$, Pounds of vitious Matter; and if in the Second Step of the ſame, we put $c=12\frac{1}{2}$, then is $y=4$, $x=2$. But if we ſuppoſe the daily Repaſt to decreaſe in a Geometrical Proportion, as 2 to 1, continuing the reſt of the *Data* the ſame as formerly, by the third Step of the ſame, the Blood will be augmented by 10 Pounds; and if in the fourth Step we put $c=10$, then will be $x=2$, $y=4$. Likewiſe, if we join theſe laſt 10 Pounds of Augmentation, to the ordinary Quantity of Blood found in a Man, then they will make up 30 Pounds; and if we ſuppoſe a Subduple Dilatation of the Veſſels, then the true Value of the Quantity of the Blood, in reſpect of the paſſable Canals, ſhall be 45 Pounds; if a Subtriple, 40 Pounds; if but a Subdecuple, then the Maſs of the Blood will be at leaſt 33 Pounds, by the 5th Step of the general Calculation: And if, in the laſt Step, we put $c=4$, then ſhall be $6=7\frac{1}{2}$, $a-6=22\frac{1}{2}$.

FROM all theſe Calculations, it is evident, that if the Augmentation of the Quantity of the Maſs of the Blood, to any aſſignable Quantity, can produce a Fever, here it may had; for if a Man naturally eats and drinks but little, or if but a ſmall Part of the Perſpiration be obſtructed, yet ſtill the Augmentation of the Blood may amount to the aſſignable Quantity if we put but leſſer Quantities for *x*, and greater for *y*, *i. e.* The difference of his daily Repaſts ſhall be leſs, or the Time, e'er he falls ſick, longer.

2. If the Urine be ſuppreſſed, either by a Stone, Ulcer, or Carbuncle in the Kidneys, Ureter, Neck of the Bladder, or *Urethra*; or by any other Cauſe in any other Place about the Organs of Secretion of Urine, and that for any conſiderable Time, the Perſon will infallibly be ſeized by a Fever more or leſs violent; and though this Fever may be partly aſcribed to the violent Pain which follows upon ſuch Obſtructions, from ſuch Cauſes, yet it is not to be doubted, but it is moſtly occaſioned by the Augmentation of the Maſs of the Blood, by ſuch a Quantity of vitious Matter, as neceſſarily muſt be accumulated by ſuch a Suppreſſion: And that we may underſtand how great this Quantity may be, let us conſider, that *Sanctorius*, in his 50th Aphor. of the 1ſt Sect. ſays, That the Perſpiration is to the Quantity voided by Urine in a given time,

as 40 to 16. Wherefore from this, and the former cited Aphoriſm, *viz.* the 6th. it follows, that the daily Repaſt, or the Quantity voided by the Mouth, is to the Quantity voided by the Urethra, as 8 to 2. Suppoſe then a Man, who has a Suppreſſion of Urine for 8 days, takes in by the Mouth every day a Pound leſs, beginning at 8; then by the firſt Step of the general Calculation, the Blood ſhall be augmented by 9 Pounds of vitious Matter. It is eaſy to apply the reſt of the Steps of the general Calcution from theſe *Data* to this Caſe, and therefore I ſhall not trouble my Reader with them: Only it may be aſked, ſince the Suppreſſion of the Urine increaſes the Quantity of the Blood, and thereby cauſes a Fever, Why, when a Man drinks a vaſt Quantity of ſtrong Liquor, he is not thereby thrown into one immediately? To this I anſwer. 1. That many of the Symptoms common to hot Fevers, are very frequently obſerved in Perſons who are drunk, which is a great Confirmation of our Doctrine; and that real Fevers do very often ſucceed violent Fits of Drunkenneſs, eſpecially if the Perſon get much Cold after them, whereby the Glands, contiguous to the Air, are obſtructed. But 2. The Reaſon why exceſſive drinking does not always, and immediately throw a Perſon into a Fever, is, that in the Time, or after the drinking, there is a vaſt Secretion by Urine. And how great a Quantity this may be, we ſhall examine thus: From what was before cited from *Sanctorius*, it is evident, a Man in a Day, or 24 Hours, voids by Urine 2 Pounds or 32 Ounces, *i. e.* there are two Pounds of Urine, ſecernible from 20 Pounds of Blood in a Day, or (taking one Hour with another) the mean Quantity ſecernible from 20 Pounds of Blood, is about 1 $\frac{1}{3}$ Ounce in an Hour: Now ſuppoſe a Man has drank ſix Pounds of a moderately ſtrong Liquor, all theſe 6 Pounds, except a very ſmall Quantity are ſecernible Serum; wherefore as 2 Pounds of ſecernible Serum is to 1 $\frac{1}{3}$ Ounce commonly ſecerned in an Hour, ſo is 8 Pounds to 5 $\frac{1}{2}$ Ounces, which upon this Conſideration will be ſecerned in one Hour; but we generally obſerve the Pulſes of drunken People to go faſter, and with greater Force, than when ſober, and that at a very extraordinary rate, inſomuch, that we may, modeſtly ſpeaking, ſay, they go twice as faſt, and with twice as great Force; wherefore upon this Conſideration, the former Quantity muſt be multiplied by 4, that is, he will paſs by Urine about 20 Ounces at leaſt in an Hour, and though he doth not ſecern ſo much every Hour, yet from this Calculation in the general, we may ſee that in 7 or 8 Hours, the moſt Part of the ſaid Liquor will be voided. Add to theſe, that the Perſpiration will be augmented at the ſame Rate, ſo that from both theſe Conſiderations, it is evident, why much drinking does not always, and immediately, caſt Men into Fevers.

3. THERE are few who are ignorant of the fatal Effects of a long continued Suppreſſion of the Menſtrual Blood in young vigorous Women: But among all theſe there are none more dangerous than the acute continued Fevers, which it often begets, this it can only do by augmenting the Quantity of the Maſs of the Blood; and how much that may be, we ſhall now examine: It is very well known that the principal Uſe of this Blood, is for the Nouriſhment of the *Fœtus* both when it is in the Belly, and on the Breaſts; and that very little beſides

ſides this, is employed, or is neceſſary to that Purpoſe, will be evident, to any one, who conſiders that Nature uſes always the moſt ſimple, direct, and uncompounded Means for obtaining her Ends; and never employs many where one might be made ſufficient, and therefore would never ordain the Suppreſſion of this Matter, the whole time from the Conception, 'till the Weaning of the Child, and the regular Evacuation of the ſame at other Times, if it were not mainly, and only neceſſary for this Purpoſe. Now *Bellini*, in his Treatiſe *de Motu Cordis*, Prop. 4. aſſigns 12 Pounds to be a mean Weight to a Human *Fœtus*, at the time of its Excluſion, ſome weighed twice as much: And therefore, in the Suppreſſion of the Menſtrual Blood in young healthy Women, the Quantity of the Augmentation of the Maſs of the Blood, will not be under 21 Ounces every Month; let us take but a Pound, or 16 Ounces, yet it is evident, (if no other Evacuation be increaſed, and if the Women be not naturally very lean, and deſtitute of Plenty of Blood) that this in a few Months, will augment the Blood to ſuch a Quantity as is able to produce a Fever, if any aſſignable Quantity can do it.

4. LASTLY, as to the Effects of a violent and long continued Coſtiveneſs towards a Fever; it muſt be granted, the *Fæces* do not come from the Blood, and conſequently cannot by their Retention augment the Quantity of the ſame: But it is likewiſe certain, if they be long ſuppreſſed, and a Man take very near his ordinary Refection, theſe Effects muſt neceſſarily follow. 1. The *Fæces* muſt be intirely percolated, and all the Juices nutritious, or otherwiſe, muſt be ſqueezed out of them into the Lacteals, which is not ſo in Perſons, who are in the Mean betwixt Conſtipation and Looſeneſs, as healthful Perſons ordinarily are, and thus one way the Blood may be augmented thereby. 2. As a Conſequence of this; they muſt extreamly harden, and fill up the Cavity of the Inteſtines, from the Anus to the Duodenum, and by this Means, the Pancreatic Juice, and Bile, muſt regurgitate, and conſequently the *Ductus Pancreaticus* and *Cholodochus*, be obſtructed, and how much the Blood may be augmented by the Obſtruction of theſe, one may gueſs from the 148 Prop. *2dæ p. Borelli de Mot. Animal.* 3. By this hard Repletion of the Inteſtines, their Glands (which are exceeding numerous)

muſt be obſtructed, and thereby the Blood augmented by the natural Quantity of their Secretion. Thus, from all theſe Conſiderations, it is clear, that the Quantity of the Maſs of Blood, may in a ſhort time be hugely augmented by a violent Conſtipation.

FINIS.

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